Gravatt, Dan

From: Hammerschmidt, Ron
Sent: Thursday, September 12, 2013 10:15 AM
To: Gravatt, Dan
Cc: Tapia, Cecilia; Asher, Audrey
Subject: FW: Bridgeton SLF- GCPT Investigation Plan- response to comment letter
Attachments: GCPT Work Plan - Revised 9-10-13.pdf; 9-10-13 Response Letter - GCPT Work Plan and HASP.pdf; GCPT Health and Safety Plan Revised 9-10-13.pdf

Dan
In case you have not previously received this. Let's talk after our 11 o'clock meeting with the group.
Ron

From: Schmidt, Aaron [mailto:aaron.schmidt@dnr.mo.gov]
Sent: Thursday, September 12, 2013 10:01 AM
To: Hammerschmidt, Ron; Gravatt, Dan; Doster, Branden; Tapia, Cecilia
Cc: Tippett Mosby, Leanne
Subject: FW: Bridgeton SLF- GCPT Investigation Plan- response to comment letter

Ron/Cecilia – I believe you have these already, but attached are the RS responses to the GCPT comment letter that DNR sent them 20 days ago. For all those reviewing, we request an expedited evaluation of these responses, and we envision our Federal Facilities Section reaching out to Dan Gravatt and summarizing their findings as we develop an approval or conditional approval on this work plan. Any concerns, call me at 573-751-0131.

Branden - I would like to see that coordination call to Dan conveying our evaluation by end of this week, so I'm asking for Friday. This is a high priority on our part and I appreciate you all rearranging your schedule to get this done. Provide a summary to me at that time also, which would allow a conceptual response to RS to be sent out early to mid- next week. Thanks.

From: Nagel, Chris
Sent: Wednesday, September 11, 2013 11:00 AM
To: Schmidt, Aaron; Doster, Branden; Muenks, Shawn; Drake, Tiffany; Garoutte, Jonathan
Subject: Bridgeton SLF- GCPT Investigation Plan- response to comment letter

Attached are Republic's response documents addressing our comment letter.

Chris Nagel
Director
Solid Waste Management Program
Missouri Department of Natural Resources
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(573) 526-3902
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0714 40484009 30
Superfund

OU-01

From: Beaudoin, Michael [mailto:mbeaudoin@cecinc.com]
Sent: Tuesday, September 10, 2013 6:47 PM
To: Schmidt, Aaron; Beaudoin, Michael; bmartz@republicservices.com; Brian Power (bpower@republicservices.com); Craig Almanza (calmanza@republicservices.com); Cunningham, Ally (LG) (ACunningham@LATHROPGAGE.COM); Jessica

E. Merrigan (jmerrigan@lathropgage.com); Jim Teter (jteter@republicservices.com); Joe Benco (jbenco@republicservices.com); JHaasis.stlouisco.com; John Nickerson; DNRContact, lyates@stlouisco.com; Mulhearn, Mary; Mike Zlatic; St. Louis Dept. of Health; William Beck
Cc: dfeezor@feezorengineering.com; Nagel, Chris; Fitch, Charlene
Subject: Bridgeton Gamma Cone Penetration Test (GCPT) Work Plan

Three documents have been uploaded to the Lathrop & Gage portal to which you have been provided access. The documents are in the "Other Submittals" portion of the page:

- GCPT Work Plan – revised 09-10-13
- GCPT Health and Safety Plan – Revised 09-10-13
- Response Letter: GCPT Work Plan and HASP

We will be providing the MDNR with two hard copies within a couple of days.

Michael R. Beaudoin, P.E. / Principal
Civil & Environmental Consultants, Inc.
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ENGINEERING, INC.

September 10, 2013

Ms. Charlene S. Fitch, P.E.
Chief, Engineering Section
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102-0176

Mr. Brandon Doster, P.E.
Chief, Federal Facilities Section

RE: North Quarry Contingency Plan — Part 2, Bridgeton Landfill, LLC, Permit Number 0118912, St. Louis County – Response to August 20, 2013 Comments Gamma Cone Penetration Test Work Plan and Gamma Cone Penetration Test Health and Safety Plan

Dear Ms. Fitch and Mr. Doster:

On behalf of our client, Bridgeton Landfill, LLC (hereinafter Bridgeton Landfill), Feezor Engineering, Inc (FEI) hereby submits revised versions of the *Gamma Cone Penetration Test Work Plan* and the *Gamma Cone Penetration Test Health and Safety Plan* based upon comments received by the Missouri Department of Natural Resources (MDNR), the Missouri Department of Health and Senior Services (MDHSS) and the U.S. Environmental Protection Agency (USEPA) on August 20, 2013. This letter lists the comments presented and provides a response to each of the 31 enumerated comments in the August 20, 2013 MDNR comment letter.

Responses contained in the letter and the two amended plans were prepared under the direction of a Missouri Professional Engineer (Daniel Feezor, P.E., MO P.E. Number E-30292). Technical contributors to these documents include P.J. Carey and Associates, P.C., Engineering Management Support, Inc., Auxier and Associates, Inc., and Civil and & Environmental Consultants, Inc.

Based upon our understanding, and discussions within the August 28, 2013 teleconference between Bridgeton Landfill, MDNR, MDHSS, and USEPA representatives, the overall approach to the Isolation Barrier investigation will consist of a two-phased investigation. The MDNR is interested in core samples, and analytical results from all eight radioisotopes. While Bridgeton Landfill has agreed to modify the original conceptual investigation plan to incorporate such sampling, the time needed to develop this entirely new set of work plans and schedules is greater than the 20 day response window. Because it is the shared interest of all parties to continue progress towards conducting the investigation, Bridgeton Landfill is submitting this Response to Comments along with

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revised versions of the previously submitted plans, modified in response to agency comments, within the 20 day response time frame. As discussed within the August 28, 2013 teleconference, Bridgeton Landfill is currently developing and will submit an additional Work Plan and Health and Safety Plan for the coring technology selected, which will include a Sampling and Analysis section describing the sampling frequency and the analytical methods required for the eight radioisotopes.

This comment response submission will focus on the Gamma Cone Penetration Test Work Plan and Health and Safety Plan, so this phase of the investigation can be initiated, and the initial results can be used in the Isolation Barrier Design. The GCPT can be used to determine porewater pressures developed during the penetration. Porewater pressure dissipation, after a push, can also be monitored for correlation to time rate of consolidation and permeability. Cone penetration test data can be used to interpret subsurface stratigraphy, and through use of site specific correlations, can provide data on engineering properties of soils intended for use in design and construction of earthwork projects. Therefore, this technology, coupled with the Gamma collection device, can provide the necessary design parameters for the Isolation Barrier. While the design is in progress, a confirmation sampling event (Phase 2 Investigation) can be implemented which will provide the necessary assurances that the barrier would be installed in an area that is devoid of unacceptable radiological materials.

This letter will respond to the comments included with your letter dated August 20, 2013. A revised Gamma Cone Penetration Work Plan and Gamma Cone Penetration Health and Safety Plan have been submitted for your consideration.

General Comments:

1. ***Definition of Radiological Impact Material (RIM)****. The document needs to be clear on what is meant by radiologically impacted material. The last sentence of the first paragraph of Section 4.1 of the Contingency Plan- Part 2 states, "It is proposed that the Isolation Barrier be located at the shallowest practical location outside of the radiological materials." The Appendix D- Isolation Barrier Schedule and Gamma Cone Penetration Test (GCPT) Work Plan (hereafter referred to as the "Work Plan") goes on to use the term "radiologically impacted material" followed by "above background" and elsewhere references the Supplemental Feasibility Study which calculated radiologically impacted material (RIM) as material greater than five (5) pCi/g above background. The Work Plan should use the term "radiological materials" to be consistent with the Contingency Plan Part 2 as well as the First Agreed Order, Section 22.B.iii, when discussing suitable locations for the isolation barrier. The Work Plan shall define the term "radiological materials" as any material with radiological readings above a statistically determined background concentration.*

Response:
Bridgeton Landfill continues to believe that 5 pCi/g above background is the appropriate standard for definition of radiologically impacted materials. This level, set as the level for unrestricted use for the West Lake and FUSRAP remedial actions, is appropriately protective for defining the barrier location. We are enclosing for your review a summary memo prepared by EMSI providing additional information on the protectiveness of the 5 pCi/g above background standard. Because this standard is relevant for the second phase of the investigation, coring and lab analysis, we would suggest that Phase 1, the GCPT study, move forward while we work to answer any remaining questions on this issue.

2. **Calculating Background.** *The Work Plan shall include methods to collect additional laboratory samples to establish representative radiological background levels at this site. A statistically defensible number of samples shall be collected within known uncontaminated areas to calculate background levels. The Department has previously cautioned on using a limited number of samples to calculate background levels via comments on the Supplemental Feasibility Study (SFS) Work Plan.*

Response:
This topic was also discussed in detail during the August 28, teleconference. It was agreed that a two-phased investigation approach will be conducted, a GCPT Phase, and a boring program phase. Background concentrations will not be needed for the GCPT phase, as existing impacted borings will be used to check the sensitivity of the gamma counter on the GCPT device.

The Phase 2 investigation boring program will have core samples tested for the eight radionuclides of concern. As discussed above, Radiologically Impacted Material will be defined as material which contains radionuclides at a concentration of 5 pCi/g above background. Therefore, background concentrations will have to be utilized for comparative analysis. Existing background concentrations for these radionuclides have been established as part of the West Lake Superfund Site Remedial Investigation and Feasibility Study. These background concentrations are reasonable consistent with background concentrations established and utilized for the North St. Louis County Formerly Utilized Site Remedial Action Program sites. If the existing background concentrations already established are deemed unacceptable, new background concentrations for the eight radionuclides will have to be reassessed. However, it is important to note that such an assessment will take from two to six months, creating additional delay in the completion of the evaluation.
Given the relative similarity of existing background analysis, it is not expected that a new more extensive background evaluation would result in a substantially different result. Because of the shared interest of all parties in completing the evaluation in order to continue progress with design planning and location confirmation for the thermal barrier, Bridgeton Landfill hopes to have continued discussions with MDNR on the usefulness of a time consuming new background investigation.

Should a new background evaluation be deemed necessary by MDNR, a 1,000 to 2,000 square meter area will be selected as a reference area. Gamma radiation levels and the concentrations of radionuclides of concern in this area's soil will be systematically assayed.

The surface of the area will be surveyed with a hand-held GPRSS (Global Positioning Radiometric Scanning System) to collect a representative population of surface gamma measurements. A minimum of 1,000 gamma measurements will be recorded during this survey.

MARSSIM guidance will be used to determine the number of soil samples required to characterize the reference area survey unit. A triangular reference grid with a random start-point and the proper number of nodes will be established over the survey unit. Soil samples will be collected at each node and assigned a unique identification number. These samples will be tracked using chain-of-custody records and sent to an accredited laboratory for radiological analysis. The resulting data will be validated and entered into a digital database for future use.

No edits have been included in the revised GCPT Work Plan to address this issue, as this issue will be addressed in the future Phase 2 Investigation Work Plan.

3. ***Core Samples.*** *The subsurface investigation shall include continuous soil core samples from a subset of sampling locations to verify the contents of the subsurface material encountered by the GCPT as well as to collect soil samples for laboratory confirmatory analyses. Since the GCPT will rely solely on sensors built into the cone tip, retrieval of continuous soil cores will be vital to verify the readings received from the GCPT. Core samples shall be collected near GCPT locations along the potential barrier alignments and advanced to native materials which will give the most valuable information on subsurface conditions (e.g. type of solid waste encountered), barrier construction geotechnical data as well as verification of GCPT readings. Please note that if elevated radiological readings are encountered at the first proposed alignment, additional continuous soil cores to the south may be warranted. A sonic drill rig is ideal for obtaining such continuous soil cores in these type geological conditions. The GCPT may be conducted prior to the core samples being completed. The GCPT can be conducted prior to the core sampling.*

Response:
This topic was also discussed in detail during the August 28, teleconference. It was agreed that a two-phased investigation approach will be conducted, and GCPT Phase, and a boring program phase. Further details pertaining to the Phase 2 boring program will be included in the Phase 2 Investigation Work Plan. No edits have been included in the revised GCPT Work Plan to address this issue, as this issue will be addressed in the future Phase 2 Investigation Work Plan.

4. ***Replacing Well D-14.*** *Section 4.2, first sentence of last paragraph states, "As discussed in the GCPT Work Plan, the investigation will also confirm the depth to native material and provide additional information on the general contents of the subsurface material (i.e. rock, municipal solid waste, construction and demolition waste, etc.)." Furthermore, the GCPT Work Plan, Section 3.1, fourth sentence of the first paragraph states, "In addition, information is to be collected at each location regarding the stratigraphy, nature, and geotechnical properties of the materials as well as liquid levels, as relates to the design of the barrier system." In order to obtain all necessary information regarding hydrogeology and groundwater characteristics for the design of the barrier system, the existing monitoring well D-14 shall be repaired or replaced during this investigation since it is the only well in the vicinity of the proposed barrier alignments. During recent sampling events it has been verified that monitoring well D-14 is damaged at a depth of approximately 30 feet below ground surface. This well no longer meets Missouri Well Construction Rules and therefore any data collected such as potentiometric surface is questionable. Information regarding the groundwater level, flow rates, and potential contaminants is crucial to the design of the barrier. This information will be used to determine the ideal barrier alignment, plans for dewatering of trenches, and final disposition of any water encountered during construction. Additional wells along the proposed barrier alignments may also be necessary to obtain this information.*

Response:
As explained previously, the GCPT can be used to determine porewater pressures developed during the penetration. Porewater pressure dissipation, after a push, can also be monitored for correlation to time rate of consolidation and permeability. Cone penetration test data can be used to interpret subsurface stratigraphy, and through use of site specific correlations, can provide data on engineering properties of soils intended for use in design and construction of earthwork projects. Therefore, the GCPT will provide the necessary design information for the Isolation Barrier design and allow for appropriate planning of liquids management during construction.

The subject of Well D-14 is outside the scope of this investigation. However, Bridgeton Landfill agrees that this well does not meet the Missouri Well Construction Rules. Bridgeton Landfill does not believe that this well can be repaired in any way which would meet Missouri Well Construction Rules. Upon direction of MDNR, Bridgeton Landfill is willing to properly abandon this well and to attempt to replace it within 50 feet of the existing location. However, in order to comply with Missouri Well Construction Rules and good practice to prevent cross contamination, the new well will not be drilled in refuse, and if no location can be found devoid of existing refuse for replacement, well D-14 will not have a replacement following its proper abandonment.

5. ***Alpha and Beta Emitters.*** *The Work Plan states that the GCPT will only detect gamma radiation. West Lake Landfill Operable Unit 1, Area l also contains alpha and beta emitters such as Thorium-230. In order to measure for alpha and beta emitting radionuclides, continuous soil core samples shall be collected from a subset of sample*

locations to obtain laboratory samples for radionuclide analyses, such as Thorium-230, as well as verification of gamma readings from the GCPT. See General Comment #3 for locations of continuous soil cores.

Response:
The purpose of the GCPT investigation is to identify subsurface radioactive material that may be present. The process is qualitative in nature and is not intended to be quantitative. Once the initial data is collected from the GCPT investigation (Phase 1) and a proposed location for the thermal barrier is determined, soil samples will be taken within the proposed barrier alignment to perform a more complete analysis (Phase 2).

The soil core samples will be taken immediately following the GCPT investigation in Phase 1 of the project, and will be extracted using sonic drilling, GeoProbe drilling, or other available and appropriate technologies.

The samples will be collected using Auxier Procedure 3.3. The soil samples will be taken at various depth locations of the core boring sample. Biased samples will be taken at locations of radioactivity as identified by field radiation detection instruments. Other samples will also be taken where no radiation is detected by such radiation detection instruments. This procedure will be detailed in the Phase 2 Investigation Work Plan.

6. ***Other Hazardous Substances.*** *In addition to radiological contaminants, West Lake Landfill Operable Unit 1, Area 1 has the potential for containing chemical contaminants such as volatile organic compounds, semi-volatile organic compounds, heavy metals, and hazardous substances such as asbestos. The Work Plan shall also include provisions for sampling for hazardous chemicals and substances which may pose health risks to isolation barrier workers. Such samples can be collected from the continuous soil cores as discussed in the previous comments.*

Response:
It was agreed that a two-phased investigation approach will be conducted, a GCPT Phase, and a boring program phase. Further details pertaining to the Phase 2 boring program will be included in the Phase 2 Investigation Work Plan. No edits have been included in the revised GCPT Work Plan to address this issue, as this issue will be addressed in the future Phase 2 Investigation Work Plan.

7. ***Data Comparability.*** *The Department notes that previous investigations conducted during the Remedial Investigation for Operable Unit 1 utilized other analytical methods besides gamma radiation detection to identify radiological materials. Additional analytical methods shall be included that are comparable to the historical data collection such as laboratory soil samples for Uranium-238, Uranium-235, and Thorium-232 decay chain radionuclides (see Remedial Investigation Report dated April 10, 2000). These additional analytical methods can be obtained by collecting continuous soil core samples as described in the previous comments.*

Response:
The Phase 1 Investigation will only include gamma scanning using the GCPT technology. Further details pertaining to the Phase 2 boring program (which will include core samples) will be included in the Phase 2 Investigation Work Plan. No edits have been included in the revised GCPT Work Plan to address this issue, as this issue will be addressed in the future Phase 2 Investigation Work Plan.

8. ***Sampling Locations.*** *The array of proposed GCPT sampling locations shall be extended to the newly installed perimeter fence to the south of Operable Unit 1, Area 1 in the vicinity of WL-120 to ensure that no radiological material is present on the Bridgeton Landfill side of the barrier (see Figure 3). The distance between sampling locations should be similar to those at the potential barrier alignment (i.e. same spacing as GCPT 12-1 through 16-1). If elevated radiological readings are encountered at the fence line, the sampling locations shall be continued outside the fence toward the North Quarry until the perimeter of elevated radiological readings is found.*

Response:
Bridgeton Landfill agrees to modify the scope of the GCPT analysis in response to this comment. Ten additional GCPT samplings will be performed. With the addition of the additional GCPT sampling sites, this will result in a total of 68 sites. The added sampling sites will be at a spacing similar to that of the current proposed GCPT sampling locations (see Figure 3).

9. ***Screening and Decontamination Procedures.*** *In general the screening and decontamination procedures are poorly presented and widely distributed throughout the Work Plan. A new section dedicated to screening and decontamination procedures should be created (such as 3.4 Screening and Decontamination Procedures) and compile the relevant discussions from Section 3.2.1.3 GCPT Rig Decontamination, Section 3.3.4 GCPT Logging, Section 3.3.5 Decontamination, and Section 3.3.6 Radiological Contamination Screening and Exit Procedures. Under no circumstances shall wash water be discharged onto the ground without prior characterization.*

Response:
A new Section 3.4 – Contamination Surveys and Decontamination Procedures, has been developed as suggested. Wash water will be collected in a container or in a plastic-lined collection area. The water will be sampled, characterized, and handled as appropriate based upon characterization.

10. ***Isolation Break*** *Plan Regardless of the Work Plan results (i.e. although unlikely, if the entire testing zone has RIM, etc.), an Isolation Break plan must be submitted that separates the subsurface smoldering event from OU 1 Area 1.*

Response:

This comment is outside the scope of the current document, so will not be addressed in this response. Bridgeton Landfill will continue its ongoing discussions with MDNR and EPA regarding contingency planning.

11. Section 4.2 of the Contingency Plan *- Part 2 does not give a clear schedule for the GCPT investigation. Include verbiage that clearly indicates the GCPT investigation will begin immediately following approval of the Work Plan.*

Response:

The GCPT investigation will begin immediately following approval of the Work Plan, however, an estimated lead time of 4 weeks will be needed to schedule the firm that will be performing the GCPT work. In addition, time is needed to schedule and provide Hazwoper and other training needed. This training can occur during the GCPT company lead time. Surficial vegetative clearing and road preparation can occur after training has been completed, but before the GCPT rig mobilizes. It is expected the entire GCPT investigation can occur in 2 months after approval is received from MDNR .

12. Appendix D, Section 1.3, Goals of the Investigation. *Please add additional primary goals to be consistent with language in Section 4 of the Contingency Plan- Part 2:*

- *Determine depth to native material*
- *Determine type of waste/subsurface material (i.e. rock, municipal solid waste, construction and demolition waste, etc.).*

Response:
The above two items have been added to Appendix D, Section 1.3, Goals of the Investigation.

13. Appendix D, Section 2.1, Prior Investigation Methods. *The fourth sentence states that eight radionuclides were identified as contaminants of concern but only seven are listed.*

Response:
Appendix D, Section 2.1, Prior Investigation Methods, has been amended to include Thorium 232.

14. Appendix D, Section 2.3, SFS Estimate of RIM Boundary. *For the purposes of this investigation, any radiological readings above background will define radiological materials (See General Comment # 1). Therefore, this section needs to be revised to explain what is defined by radiologically impacted material (RIM). If the definition of RIM from the Supplemental Feasibility Study (SFS) will still be used to depict boundaries of areas to be excavated under a cleanup scenario, a distinction between the SFS RIM and radiological materials above background will need to be made.*

Response:
See response to comment No. 1.

15. ***Appendix D, Section 3.2, Gamma Cone Penetration Testing (GCPT).*** *The last sentence of the second paragraph of this section states, "The advance rate is approximately one inch (1 ") per minute." Is this advance rate correct?*

Response:
Per ConeTec, Inc., the advance rate of the probe is approximately 2 cm/second which is the ASTM Standard. Appendix D, Section 3.2, Gamma Cone Penetration Testing (GCPT), has been amended accordingly.

16. ***Appendix D, Section 3.2.1.2.1, CPT Device (Lithology Calibration).*** *This section describes the use of previous boring locations WL-108, WL-111, and WL-119 to "calibrate" the GCPT sensor to various zonation conditions. Review of these bore logs included in the Appendix reveals that there is no "zonation" identified in the majority of the boring strata. The purpose of the GCPT is to fill in the data gaps from the previous investigation such as the lack of zonation detail in these bore logs (i.e. soil, rock, municipal solid waste, construction and demolition waste, etc.). Therefore, the Department does not understand how these bore logs can be used to "calibrate" the device. Other means to calibrate and/or verify the sensor readings shall be used such as collecting continuous soil core samples from a subset of locations as described in previous comments.*

Response:
The GCPT device correlation will only be between waste and in-situ alluvium, as it pertains to lithology. Appendix D, Section 3.2.1.2 has been modified to further explain the correlation.

17. ***Appendix D, Section 3.2.1.2.2, Gamma Sensor (Radiologically Impacted Material Calibration).*** *Due to the heterogeneity of radiological contamination, the use of previous borings (PVC-38) to calibrate the gamma sensor is not advisable. Background measurements shall be established within a known uncontaminated area, preferably outside of Operable Unit I, Area l. If calibration to a radiological reading is required, discreet soil samples can be collected directly from the contaminated interval. A range of gamma readings from the GCPT should be verified with discreet soil samples to determine if the sensor can accurately measure impacted radiological materials slightly above background and not just highly contaminated materials versus non-detect. This section should also describe a method to perform a response check of the GCPT instrument at the beginning and end of each day to verify the detector's response.*

Response:
The use of boring holes PVC-38 and PVC-28 are to correlate the readings obtained by the GCPT device in a boring known to have increased levels of radiation. This procedure will

ensure that the device is operating as expected as the sensitivity to radiation is confirmed. As recommended by the USEPA in General Issue comment number 2, Bridgeton Landfill will also include a boring location of low or intermediate gamma readings to further define the relative sensitivity of the GCPT device. As such, boring hole PVC-28 will be added as an additional correlation site. Appendix D, Section 3.2.1.2.2, Gamma Sensor (Radiologically Impacted Material Correlation), has been amended accordingly.

A daily response check of the GCPT will be performed with a check source such as a container of potassium carbonate (K_2CO_3) (which contains the naturally occurring isotope potassium-40) or a button source. This response check will be performed at the beginning and end of each day. Appendix D, Section 3.2.1.2.2, Gamma Sensor (Radiologically Impacted Material Correlation), has been amended accordingly.

18. ***Appendix D, Section 3.2.1.3, GCPT Rig Decontamination.*** *The first sentence states, "Contamination will be evaluated per the CPT rig operator's decontamination procedure, and will at a minimum consist of scanning all rods which were advanced below the ground surface." More detail on the decontamination procedures of the drill rods is needed including what equipment is being used to scan the drill rods. See General Comment #9 regarding compilation of decontamination procedures.*

Response:
Tool strings (push rod probes) will be washed/wiped as they are removed from the ground to remove visible dirt and mud. Tools will then be cleaned with soapy water and wiped dry. Sections of the tool string will be sampled with a swipe to detect any removable activity on the surface of the tool string between sampling locations. The swipe samples will screened in the field with a Ludlum Model 12 coupled to a Model 43-5 alpha detector. A final measurement of alpha and beta activity will be performed using a Ludlum 2929 coupled to a 43-10-1 or a low-background alpha/beta counter such as a XLB-5. Please see Appendix D, new Section 3.4.

19. ***Appendix D, Section 3.2.1.3, GCPT Rig Decontamination.*** *The fifth sentence of this section states, "The wash water will be discharged onto the ground within the Area 1 decontamination pad and allowed to infiltrate into the gravel surface." Due to the potential to encounter radiological and other contaminants, the wash water shall be containerized and characterized prior to disposal. If acceptable, the wash water can be disposed into the leachate collection system. Any solids generated during drilling activities should also be containerized and characterized for proper disposal. See General Comment #9 regarding compilation of decontamination procedures.*

Response:
Wash water will be collected, characterized and handled as appropriate based upon characterization. All wash water will be disposed at a permitted facility. Likewise, any solid radioactive waste will be containerized and characterized for proper disposal. Please see Appendix D, new Section 3.4.

20. Appendix D, Section 3.3.1 Land Clearing. *The fourth sentence of the first paragraph states, "The vegetation will be cleared by selective woody vegetation removal techniques which allow small track mounted machines to cut and grind the vegetation in place." This activity should be kept to a minimum. Extra effort shall be given to find suitable paths that do not require grubbing. Additional provisions should be included in the Work Plan to minimize/eliminate the use of machines that will grind vegetation and instead use handheld equipment to clear/prune vegetation where practicable.*

Response:
Bridgeton Landfill will work with its subcontractor to minimize grinding of vegetation as much as possible. If appropriate and indicated, vegetation may be wetted before grinding. It is Bridgeton Landfill's goal to minimize any airborne particles generated by the vegetation clearing process. As recommended, extra effort will be given to finding suitable paths that do not require grubbing, and the use handheld equipment to clear/prune vegetation will be used where practicable. Appendix D, Section 3.3.1 Land Clearing, has been amended to reflect this change.

In response to this comment and Appendix E, Comment 2, from the Missouri Department of Health and Senior Services, we would refer to the March 30, 2009, Vegetative Sampling Results Summary from Engineering Management Support, Inc. This report concludes that no significant radiological uptake has occurred in the vegetation. The report also states that the vegetation debris generated during the clearing/grubbing effort will be much less of a respiratory hazard than that of soil due to particle size. Also, the vegetation material has a very high moisture content and therefore will not become airborne.

21. Appendix D, Section 3.3.1 Land Clearing. *The third sentence of the second paragraph states, "The paths will be guided by an onsite health physicist who will conduct an overland gamma scan." Please include more detail on the overland gamma survey including the procedure and methodology.*

Response:
A Ludlum 2221 ratemeter/scaler mated to a Ludlum 44-20 3x3" NaI detector will be used to survey selected portions of ground surface within and around Area 1. This instrument will be coupled to a Trimble GPS and operated in the ratemeter mode. This mode will allow the gamma count rate from the instrument to be collected at one-second intervals and assigned to its specific measurement location (latitude and longitude).

The operator will hold the detector approximately 30 cm above the ground surface and advance across the areas of interest in a series of straight lines at a rate of approximately one meter per second. The separation distance between the lines will be approximately 1.5 meters. After the survey, the field data will be processed using a combination of industry-standard commercial computer applications. Because all data points will be tied to a spatial coordinate, a map of the data will identify areas of surface soil containing

RIM. These areas can then be located in the field and avoided or covered. Appendix D, Section 3.3.1 Land Clearing, has been amended to include this information.

22. Appendix D, Section 3.3.1 Land Clearing. *The last paragraph contains a couple typographical errors. The word "about" in the third sentence should be replaced with "above". The word "truck" in the fifth sentence should be replaced with "trunk".*

Response:
These typographical errors have been corrected in Appendix D, Section 3.3.1 Land Clearing.

23. Appendix D, Section 3.3.2 Near-Surface Preparation. *The second paragraph of this section describes removal of surficial layers of concrete and other inert rubble with a track hoe prior to the GCPT investigation. This activity should be kept to a minimum. The text should be revised to state this and also include provisions to survey and log the depth of any such material that is relocated, if necessary.*

Response:
Any removal of any surficial concrete or other rubble will be kept to an absolute minimum. The GCPT approach is intended to disturb the soil as little as possible, if at all. This activity was included as a contingency response in case subsurface materials interfered with the investigation path. If any material removal is needed, a radiation survey will be performed of any such materials moved and records will be maintained. Appendix D, Section 3.3.2 Near-Surface Preparation, has been modified to reflect this information.

24. Appendix D, Section 3.3.4, GCPT Logging. *The third to last sentence of the first paragraph states, "After the boring is completed, the GCPT rig will be decontaminated within the non-radiological decontamination area if no RIM was encountered." Please clarify why the GCPT rig will be decontaminated if no RIM is encountered, such as decontamination for non-radiological contaminants. Also please consolidate screening and decontamination procedures (see General Comment #9).*

Response:
If radioactive contamination is detected, the equipment will be moved to the radiological decontamination pad. Any loose material will be removed by brushing and wiping with wet rags. After loose material has been removed, the equipment will be surveyed again for both alpha and beta surface activity. If fixed or removable activity exceeding the release limits is found, the rig will be decontaminated and resurveyed. After a piece of equipment is cleared for release, or if no radioactive contamination is detected, the equipment will moved to the non-radiological pad where it will be washed to remove visible traces of dirt and mud prior to its release. This final housekeeping can be performed in an uncontrolled area and any water generated from the previously released equipment will be considered unimpacted. See Appendix D, new Section 3.4.

25. Appendix D, Section 3.3.4, GCPT Logging*. The last sentence of this section states, "Each sounding hole will be filled with bentonite-coated pea gravel from the surface." Missouri Well Construction Rules, 10 CSR 23-6.050(A), states that test holes with no surface casing must be filled with grout via tremie to within two feet (2') of the ground surface.*

Response:
This issue was discussed in the August 28, 2013 teleconference. There was mutual agreement that minimizing pipes into the boreholes such as tremie pipes would be advantageous, and the MDNR would work with Bridgeton Landfill in obtaining the necessary variances needed to comply with 10 CSR 23-6.050(A).

26. Appendix D, Section 3.3.5, Decontamination. *The discussion in this section should be compiled into a new section titled Screening and Decontamination Procedures (see General Comment #9).*

Response:
See response to Comment 9.

27. Appendix D, Section 3.3.6, Radiological Contamination Screening and Exit Procedures. *The discussion in this section should be compiled into a new section titled Screening and Decontamination Procedures (see General Comment #9).*

Response:
See response to Comment 9.

28. Appendix D, Table 1. *This table does not include a trigger for commencing with construction of the isolation barrier (i.e. there needs to be a decision point between the last two boxes that coincides with the triggers in Part 1 of the Contingency Plan).*

Response:
A decision point has been added between the last two boxes of Appendix D, Table 1, as requested.

29. Appendix E, Section 5.3, Chemical Hazards. *This section does not mention the potential for encountering hazardous waste, putrescible waste, and landfill gases during the GCPT exercise. No action plan has been provided to investigate, characterize, and abate potential exposure to chemicals. Methodology to monitor for encroachment into contaminated soils or detecting vapors emitted from within borings should be provided. The Health and Safety Plan (HSP) should discuss the potential for exposures, and include a contingency plan to protect workers from exposure. Worker protection standards must be met in the event these potential hazards are encountered. Update the HSP accordingly****.***

Response:
The Health and Safety Plan has been amended to include information on chemical hazards.

30. ***Appendix E, Section 5.4.2, Radiological Controls.*** *This section should include procedures for use of real-time measurement devices such as dose rate meters and dosimeters to measure worker exposure to radioactivity.*

Response:
Electronic Personal Dosimeters will be issued to workers on this jobsite. The dosimeters will be collected and read at the end of each shift. These results will be considered monitoring data. Doses of record will be determined from TLD monitoring badge for that individual. Appendix E, Section 5.4.2, Radiological Controls has been amended to include this information (Health and Safety Plan).

31. ***Appendix E, Section 6, Training.*** *This section of the Health and Safety Plan does not include specific training requirements of on-site workers. Please include specific training that meets the requirements of 29 CFR 1910.120 and other general training such as General Employee Training (GET) and General Employee Radiological Training (GERT). The Department expects workers to meet these training requirements at similar sites.*

Response:
Workers will receive training in accordance with 29 CFR 1910.120 and will include General Employee Training (GET) and General Employee Radiological Training (GERT). Appendix E, Section 6, Training, has been amended to reflect this information (Health and Safety Plan).

Thank you again for your cooperation in this matter. If you have any questions, please feel free to contact me.

Sincerely,

Daniel R. Feezor, P.E.
Feezor Engineering, Inc.
dfeezor@feezorengineering.com

Attachments: September 9, 2013 memo from Engineering Management Support, Inc. re: Definition of Radiologically Impacted Material (RIM)

MEMORANDUM

To: Dan Feezor, P.E., Feezor Engineering Inc.

From: Paul Rosasco, P.E.

Subject: Definition of Radiologically-Impacted Material (RIM)

Date: September 9, 2013

Per your request, Engineering Management Support, Inc. (EMSI) has evaluated the Missouri Department of Natural Resources (MDNR) comment on the definition of radiologically-impacted material (RIM) included in the Gamma Cone Penetration Test (GCPT) Work Plan. MDNR's comment on this is included below followed by our evaluation of the appropriateness of the criteria used in the GCPT Work Plan.

1. ***Definition of Radiological Impact Material (RIM)****. The document needs to be clear on what is meant by radiologically impacted material. The last sentence of the first paragraph of Section 4.1 of the Contingency Plan- Part 2 states, "It is proposed that the Isolation Barrier be located at the shallowest practical location outside of the radiological materials." The Appendix D-Isolation Barrier Schedule and Gamma Cone Penetration Test (GCPT) Work Plan (hereafter referred to as the "Work Plan") goes on to use the term "radiologically impacted material" followed by "above background" and elsewhere references the Supplemental Feasibility Study which calculated radiologically impacted material (RIM) as material greater than five (5) pCi/g above background. The Work Plan should use the term "radiological materials" to be consistent with the Contingency Plan Part 2 as well as the First Agreed Order, Section 22.B.iii, when discussing suitable locations for the isolation barrier. The Work Plan shall define the term "radiological materials" as any material with radiological readings above a statistically determined background concentration.*

Response:

Use of the 5 picocurie per gram (pCi/g) plus background criteria for total radium and total thorium is an appropriately conservative basis for identification of radiologically-impacted material (RIM) for placement of a possible contingent thermal barrier located between the North Quarry Landfill of the Bridgeton Landfill and Radiological Area 1 of the adjacent West Lake Landfill. The protectiveness of this criterion is discussed below. The possible effects of a subsurface smolder event (SSE) on

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possible occurrences of radionuclides at activity levels below this criterion but above background are also discussed.

EPA has developed guidance that addresses the appropriateness of using standards promulgated for cleanup of sites under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for use in developing cleanup levels for other sites that contain radium and thorium isotopes (Luftig and Weinstock, 1998)[1]. The following paragraphs summarize pertinent points from this guidance as it relates to use of UMTRCA criteria as a basis for identification of radiological materials relative to the gamma cone penetrometer testing (GCPT) for the North Quarry Contingency Plan.

On January 5, 1983, EPA promulgated in Subpart B of 40 CFR Part 192 (48 FR 590 to 606) *Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites.* Specifically, these standards state:

> Remedial actions shall be conducted so as to provide reasonable assurance that, as a result of residual radioactive materials from any designated processing site:
>
> (a) The concentration of radium-226 in land averaged over any area of 100 square meters shall not exceed the background level by more than--
>
> (1) 5 pCi/g, averaged over the first 15 cm of soil below the surface, and
> (2) 15 pCi/g, averaged over 15 cm thick layers of soil more than 15 cm below the surface.

These standards were developed specifically for the cleanup of uranium mill tailings at 24 sites designated under Section 102(a)(1) of UMTRCA (Title I sites). The purpose of these standards was to limit the risk from inhalation of radon decay products in houses built on land contaminated with tailings, and to limit gamma radiation exposure of people using contaminated land (see 48 FR 600).

Subpart B of 40 CFR Part 192 contains two different soil standards. The concentration criterion for surface soil (5 pCi/g above background of radium-226) is a health-based standard. The relevant source of health risk for surface soil is exposure to gamma radiation, which is the basis for this standard. EPA determined that the concentration criterion for subsurface soil (15 pCi/g of radium-226) is not a health-based standard, but rather was developed for use in limited circumstances to allow the use of field measurements rather than laboratory analyses to determine when buried tailing had been detected. Conditions at the West Lake Landfill are not sufficiently similar to the limited circumstances identified by EPA to allow for use of the subsurface criterion at the West Lake Landfill.

The 5 pCi/g above background standard was initially developed for a single radioisotope (radium-226) to control the hazard from radiation. In Subpart E of 40 CFR Part 192 (48 FR45947)

[1] Use of Soil Cleanup Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites, Stephen D. Luftig and Larry Weinstock, OSWER Directive 9200.4-25, February 12, 1998.

Standards for Management of Thorium Byproduct Materials Pursuant to Section 84 of- the Atomic Energy Act of 1954, as Amended, EPA determined that these standards were suitable for remediation of radium-228 at Title II sites (see 48 FR 45944 and the FEIS for *Standards for the Control of Byproduct Materials from Uranium or Processing (40 CFR 192) Volume I, Appendix G: Thorium Mill Tailings).* Because the risk from uranium and thorium byproducts is additive, and because the 5 pCi/g and 15 pCi/g standards are based on total acceptable risk, whenever the 5 pCi/g and/or 15 pCi/g standards are used as relevant and appropriate requirements (or to-be-considered criteria [TBC's]) at CERCLA sites with some combination of radium-226 and radium-228, EPA has determined that these soil standards should apply to the combined level of contamination of radium-226 and radium-228 above background.

EPA has also determined that in order to meet a permanent clean-up objective for radium-226 and radium-228 of 5 pCi/g above background, there needs to be reasonable assurance that the preceding radionuclides in the series will not be left behind at levels that will permit the combined radium activity to build up to levels exceeding this level after completion of the response action. At a minimum, this would generally mean that thorium-230 (the parent of radium-226) and thorium-232 (the parent of radium-228) should be cleaned up to the same concentrations as their radium progeny. Therefore, whenever the 5 pCi/g and/or 15 pCi/g standards are used as relevant and appropriate requirements (or TBC's) at CERCLA sites with some combination of thorium-230 and thorium-232, these soil standards should apply to the combined level of thorium-230 and thorium-232 above background.

As indicated in the EPA guidance, the cleanup level of 5 pCi/g plus background is protective from exposure to radiation under an uncontrolled (residential land use) scenario. EPA has determined that cleanup of UMTRCA sites using the 5 pCi/g and 15 pCi/g soil standards under 40 CFR 192 is consistent with an upper bound of 15 millirems per year (mrem/yr) effective dose equivalent (EDE) under a rural residential exposure scenario for radium-226, radium-228 and thorium-232 and is much more stringent for thorium-230.[2] EPA has also determined that for land uses other than residential (e.g., commercial/industrial, recreational) the UMTRCA cleanup standards are more stringent for all four radionuclides.[2] Therefore, use of the 5 pCi/g plus background cleanup standard for delineation of radioactively impacted material will be protective of all possible exposure scenarios that could occur at the West Lake Landfill.

MDNR has requested additional information on the possible impacts of a subsurface smoldering event on low levels of radionuclides (i.e., below the 5 pCi/g above background level). Potential occurrences of low levels of radionuclides on the interior (Bridgeton Landfill side) of a possible contingent thermal barrier do not pose any significant risks of impacts.

A possible occurrence or lateral extension of an SSE into an area containing low levels of radionuclides would not cause any changes or significant impacts. There would be no increase in gamma or alpha radiation emissions. Emission of gamma or alpha radiation from radionuclides is a

[2] Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination, Stephen D. Luftig and Larry Weinstock, OSWER Directive No. 9200.4-18, August 22, 1997.

function of radioactive decay. Radioactive decay is a function of time and the half-lives of the various radionuclides. This decay occurs independent of temperature or pressure conditions and therefore, increases in temperature or pressure that may occur as a result of an SSE will not increase or otherwise affect the rates of radioactive decay of radionuclides.

Because rate of decay would not be affected, there would be no increase in radon production. But it is possible that changes in surrounding soil could change the rate of release of radon to the air. Vaporization of the entrained moisture within the refuse and RIM could result in an increase in interstitial vapor pressure in the vicinity of the heat front as a result of the conversion of the entrained moisture from liquid to vapor (i.e., a steam front). Although occurrence of an SSE is not expected to increase radon emanation (some literature suggests that a reduction in pore water content could result in a decrease in radon emanation), occurrence of an SSE could potentially result in a slight, temporary increase in radon migration rates due to the increased interstitial vapor pressure gradients in the immediate area of the increased heat front associated with an SSE and potential increases in gas phase permeability due to decreased pore water content. Essentially, the gas pressure may speed the rate at which gas moves to the surface, and the drying of the surrounding soil may allow vapors to move through soil more quickly.

Radon has a relatively short half-life and during the time it takes gas to move from the subsurface to the surface, some radon will naturally attenuate through radioactive decay. An increase in radon migration rates would decrease the radon attenuation because the increased migration rate would leave less time for decay of radon in the subsurface. Therefore the increased migration rate could result in a temporary increase in the rate of radon exhalation – release to air. Such potential, temporary increases in radon migration and exhalation rates are expected to be localized due to the localized nature of the heat/steam fronts. Measurements conducted as part of the Remedial Investigation[3] indicated that the overall radon flux from Area 1 was 13 $pCi/m^2/sec$ compared to the established standard of 20 $pCi/m^2/sec$. Review of the radon flux measurements data indicates that the radon flux values measured in the area between the extent of RIM (i.e., the extent of total radium or total thorium above the 5 pCi/g criterion) and the North Quarry Landfill were very low, ranging from 0.1 to 0.5 $pCi/m^2/sec$. Therefore, the existing radon flux of materials that are below the 5 pCi/g above background level is very low and any possible reductions in radon attenuation that could result from occurrence in an SSE in this area are not expected to increase the overall radon flux above the risk-based regulatory standard of 20 $pCi/m^2/sec$. It is also noteworthy that the 5 pCi/g above background standard was developed for surficial soils – so deemed protective even in the absence of the attenuation that would result from migration through soil cover or other barrier (e.g., a possible ethylene vinyl alcohol [EVOH] barrier layer associated with possible contingent actions for the North Quarry Landfill).

Based on this analysis, use of the 5 pCi/g above background criterion to identify the extent of RIM is both appropriately conservative and consistent with established EPA guidance and risk-based criteria. Possible occurrences of radionuclides at levels below the 5 pCi/g criterion even on the

[3] Remedial Investigation Report, West Lake Landfill Operable Unit 1, Engineering Management Support, Inc., April 10, 2000.

"SSE-side" of a possible contingent thermal barrier would not result in any additional risks or impacts, even assuming maximum migration and without even accounting for radon reduction associated with the proposed enhanced capping system (e.g. EVOH cap) that may be implemented as part of contingent actions for the North Quarry Landfill.

ENGINEERING FOR A BETTER WORLD
FEEZOR
ENGINEERING, INC.

BRIDGETON LANDFILL - WEST LAKE LANDFILL

GAMMA CONE PENETRATION TEST (GCPT)
HEALTH AND SAFETY PLAN
REVISION 1

BRIDGETON, ST. LOUIS COUNTY, MISSOURI

Prepared For:
Bridgeton Landfill, LLC
13570 St. Charles Rock Road
Bridgeton, MO 63044

September 10, 2013

Project No.: BT-012

Prepared By:

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9-10-13

GCPT Health and Safety Plan

Bridgeton Landfill, LLC

LIST OF TABLES

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1 INTRODUCTION

This Health and Safety Plan (HSP) was developed for Feezor Engineering, Inc. (FEI) employees and subcontractors under agreement with FEI for subsurface investigations in the southern portion of Operable Unit 1 (OU-1), Radiological Area 1 (Area 1) of the West Lake Landfill immediately to the north of Permitted North Quarry Landfill at the Bridgeton Landfill.

The purpose of this HSP to provide background information and establish standard personal protection standards and health and safety policies/procedures for work practices of FEI and Subcontractor employees during performance of subsurface investigations along the south side of Area 1. Prior to any work, a copy of this HSP will be distributed to all FEI employees and subcontractor personnel involved with this work. Prior to anyone beginning work, they will be required to read this HSP and sign the Compliance Agreement included in Appendix A.

The levels of protection and the procedures specified in this HASP are based on information available at this time, and represent the minimum health and safety requirements to be observed by all FEI and Subcontractor employees while engaged in this project. Unforeseeable site conditions may warrant the use of higher levels of protection. Subcontractors are required to provide the necessary safety equipment and safety training to their personnel in compliance with the Occupational Safety and Health Administration (OSHA) regulations provided in 29 CFR 1926.

The content of this HSP may change or undergo revision as additional information is obtained during the field activities. Any changes to this HSP must be reviewed by the Project Health and Safety Officer and are subject to approval by the Project Manager.

Field personnel must read this document carefully. If you have any questions or concerns that you feel are not adequately addressed, ask your supervisor or the Project Health and Safety Officer. Follow the designated health and safety procedures, be alert to the hazards associated with working on any construction site in close proximity to heavy equipment, and above all else, use common sense and exercise reasonable caution at all times.

The HSP is organized as follows:

- Section 2 describes the project safety personnel;
- Section 3 provides information regarding the West Lake Landfill site;
- Section 4 summarizes the field activities to be conducted as part of the subsurface investigations;
- Section 5 presents an evaluation of the hazards that may be encountered during the performance of the field activities and includes control measures for the hazards;
- Section 6 includes general training requirements;
- Section 7 describes the general health and safety procedures to be employed during the field activities; and

- Section 8 lists the emergency contacts and the procedures to be implemented in the event of an accident or other emergency.

2 PROJECT SAFETY PERSONNEL

Personnel responsible for project safety during performance of the subsurface investigations along the south side of Area 1 are the Project Manager, the Project Health and Safety Officer, and the On-Site Health and Safety Officer for each subcontractor.

The Project Health and Safety Officer has responsibility for establishing appropriate health and safety procedures for the project (as presented in this Health and Safety Plan) and has the authority to implement those procedures including, if necessary, the authority to temporarily shut down the project for health and safety reasons. The On-site Health and Safety Officer for each subcontractor will be responsible for assuring that the procedures specified in this Health and Safety Plan are implemented in the field and also has the authority to temporarily shut down the project for health and safety reasons. The Project Manager will have overall responsibility for project health and safety and has the authority to take whatever actions may be necessary to provide a safe working environment for all Subcontractor personnel. The personnel fulfilling these responsibilities and their mobile telephone numbers are included in Table 1.

The ultimate responsibility for the health and safety of the individual employee rests with the employee. Each employee is responsible for exercising the utmost care and good judgment in protecting his or her own health and safety, and that of fellow employees. Should any employee observe a potentially unsafe condition or situation, it is the responsibility of that employee to immediately bring the observed condition to the attention of their fellow employees and the appropriate health and safety personnel.

Should an employee find himself or herself in a potentially hazardous situation, the employee shall immediately discontinue the hazardous procedure(s) and personally take appropriate preventative or corrective action, and immediately notify the Site Health and Safety Officer of the nature of the hazard. Any site personnel may stop any work activity that is assessed to be an imminent safety hazard, emergency situation, or other potentially dangerous situation. Once work has been halted for any safety reason, the On-site Health and Safety Officer for the specific contractor and Project Manager must be notified immediately by the party calling for the stop. The reasons for the work stoppage will be discussed with the On-site Health and Safety Officer and the Project Manager. The Project Manager will make the decision as to whether work may continue or if actions need to be taken to correct an unsafe situation or activity.

3 SITE INFORMATION

This section includes discussions on the site location and surrounding areas, historical landfill operations and disposal areas, the Superfund Operable Units, and current site uses. Information regarding climate in the area and surface water runoff drainage patterns are also provided.

3.1 SITE LOCATION AND SURROUNDING AREA

The site includes the permitted North and South Quarry Landfills that make up the Bridgeton Sanitary Landfill and the former Demolition Landfill, Inactive Sanitary Landfill and Radiological Areas 1 and 2 that make up the West Lake Landfills. The site is located within the western portion of the St. Louis metropolitan area on the east side of the Missouri River floodplain approximately two miles east of the river. The landfills are located approximately one mile north of the intersection of Interstate 70 and Interstate 270 within the city limits of the City of Bridgeton in northwestern St. Louis County.

The site is bounded to the east and northeast by St. Charles Rock Road (State Highway 180) [Figure 1]. Commercial and industrial properties bound the site immediately to the north, across St. Charles Rock Road to the north and east, and to the south. The site is bounded on the west by Old St. Charles Rock Road (vacated) and the Earth City Industrial Park stormwater/flood control pond. The Earth City commercial and industrial complex continues to the west and north of the stormwater/flood control pond and extends from the site to the Missouri River. Earth City is separated from the Missouri River by an engineered levee system.

3.2 HISTORIC LANDFILL OPERATIONS AND DISPOSAL AREAS

The West Lake Landfill is an approximately 200-acre parcel containing multiple areas of past operations. The site was used agriculturally until a limestone quarrying and crushing operation began in 1939. The quarrying operation continued until 1988 and resulted in two quarry pits, the North Quarry Pit and the South Quarry Pit (Figure 1), which were excavated to maximum depth of 240 feet below ground surface (bgs) (Herst & Associates, 2005).

The West Lake Landfill is the site of several areas where solid wastes have been disposed. Beginning in the early 1950s or perhaps the later 1940s, portions of the quarried areas and adjacent areas were used for landfilling municipal refuse, industrial solid wastes, and construction/demolition debris. The Bridgeton Sanitary Landfill waste mass encompasses approximately 52 acres with approximately 240 feet below the ground's surface and a total waste thickness of 320 feet. The waste is located in two distinct areas known as the North and South Quarries. The Bridgeton Sanitary was initially permitted on Nov. 18, 1985 and ceased accepting waste on Dec. 31, 2004 pursuant to an agreement with the City of St. Louis to reduce the potential for birds to interfere with airport operations. The Bridgeton Sanitary Landfill is inactive and closure activities are proceeding under Missouri Department of Natural Resources (MDNR) supervision.

In addition to the Bridgeton Sanitary Landfill north and south quarry pits currently in the process of closure/post-closure, the West Lake Landfill property contains four other areas where solid wastes were disposed (Figure 1):

- Area 1 where solid wastes and radiologically-impacted materials were disposed;
- Area 2 where solid wastes and radiologically-impacted materials were disposed;
- A closed demolition landfill; and
- An inactive sanitary landfill.

The Bridgeton Landfill includes the North and South Quarry Permitted Landfill cells. Waste disposal activities in these areas began in 1985 with filling of the North Quarry Landfill and continued with placement of solid wastes progressing to the south until the South Quarry Landfill was filled. Waste disposal activities at the Bridgeton Landfill ceased in 2004 and a final soil cover was subsequently placed over the North and South Quarry Landfills. In 2013, a geosynthetic cover composed of a green 60 mil Ethylene Vinyl Alcohol (EVOH) liner was installed over the South Quarry Landfill to reduce the potential for odor emissions. Enhancements to the landfill gas extraction and leachate collection systems at the South Quarry Landfill were also installed prior to and during that cap installation.

3.3 Superfund Operable Units

Superfund-program remedial action at the site is divided into two operable units (OUs). OU-1 is comprised of the solid wastes and radiologically-impacted materials disposed in Areas 1 and 2 and portions of an adjacent property, the Buffer Zone/Crossroad Property.

OU-2 consists of the other landfill areas that are not impacted by radionuclides and includes the inactive sanitary landfill located adjacent to Area 2, the closed demolition landfill, and the Bridgeton Sanitary Landfill located in the North and South Quarry Pits. The closed demolition landfill and the Bridgeton Sanitary Landfill, while designated as part of OU-2, are regulated by the MDNR pursuant to State of Missouri solid waste regulations and are not being actively addressed by the Superfund program.

Area 1 is situated on the northern and western slopes of a topographic high within the overall West Lake landfill property. Ground surface elevation in Area 1 varies from 490 feet above mean sea level (AMSL) on the south to 452 feet AMSL at the roadway near the transfer station entrance (Figure 2).

Area 2 is situated between a topographic high of landfilled materials on the south and east, and the Buffer Zone/Crossroad Property on the west. The highest topographic level in Area 2 is about 500 feet AMSL on the southwest side of Area 2, sloping to approximately 470 feet AMSL near the top of the landfill berm (Figure 2). The upper surface of the berm along the western edge of Area 2 is located approximately 20 to 30 feet above the adjacent Buffer Zone/Crossroad Property and approximately 30 to 40 feet higher than the water surface in the flood control channel located

to the south-west of Area 2. A berm on the northern portions of Area 2 controls runoff to the adjacent properties.

Municipal solid waste, construction and demolition debris, quarry spoil material and possibly other wastes were disposed of in Areas 1 and 2. Reportedly, 38,000 to 39,000 tons of soil were mixed with approximately 8,700 tons of leached barium-sulfate residue, and of this amount, 43,000 tons were sent to West Lake Landfill over the period from July through October 1973 (Nuclear Regulatory Commission [NRC], 1976 and 1988 and RMC, 1982). Post-disposal investigations by the NRC suggest that the 43,000 tons of soil mixed with leached barium-sulfate residue were spread and used as cover material for the landfill operations. Per the NRC, "This material was hauled to the landfill area and used as cover for part of the several hundred truckloads of garbage and refuse that are shipped to the landfill area site every week." Landfilling of waste materials continued to be performed both during and after disposal of the radiologically-impacted soil mixture .

Radiological constituents in Areas 1 and 2 occur in soil materials that are intermixed with and interspersed within the overall matrix of landfilled refuse, debris and fill materials, and unimpacted soil and quarry spoils. In some portions of Areas 1 and 2, radiologically-impacted materials are present at the surface; however, the majority of the radiological occurrences are present in the subsurface beneath these two areas. At the Buffer Zone/Crossroads properties the radiologically-impacted materials are found in soils believed to have been carried by erosion from the Area 2 berm prior to growth of the current on-site vegetation.

In general, the primary radionuclides detected at levels above background concentrations at the West Lake Landfill are part of the uranium-238 and uranium-235 decay series. Thorium-232 and radium-226 isotopes from the thorium-232 decay series are also present above background levels but at a lesser frequency.

3.4 Current Site Uses

The West Lake Landfill is located in a predominantly industrial area. The entire landfill area, including the areas investigated under OU-1 and OU-2, has been the site of historic quarry operations to remove limestone, and landfill operations. Other activities on the OU-2 portion of the property include a solid waste transfer facility, concrete and asphalt batch plant operations, and an auto repair facility (Figure 1).

With the exception of the Buffer Zone, all of the site area has previously been developed and was used for or in conjunction with disposal of solid wastes at the site or is currently being used in conjunction with the various industrial operations conducted at the Site. Areas 1 and 2, the closed demolition landfill, the inactive sanitary landfill, and the former Bridgeton Sanitary Landfill located in the North and South Quarry pits (Figure 1) were all used for disposal of solid wastes. Current activities in these areas consist of maintenance of the landfill covers and environmental

monitoring. Extraction of leachate continues to be performed on an ongoing basis from the North and South Quarry Pits.

In addition to the area containing the transfer station entrance road and site office trailer/weigh station, there are two areas located outside of the solid waste disposal units in which industrial activities are conducted at the site. These include the area in the central portion of the site where the solid waste transfer station and the concrete and asphalt batch plants are located, and a small area near the southwestern portion of the site in which an automobile repair facility is located (Figure 1). In addition to these areas, the Republic Services district office and refuse collection vehicle parking and repair lots are located outside of but adjacent to the site. The landfill stormwater retention pond and OU-2 on-site soil borrow and stockpile area are also located on property outside of but adjacent to the site (Figure 1).

3.5 Climate and Meteorology

The climate of the landfill area is typical of the Midwestern United States with a modified continental climate that has four distinct seasons.

Winter temperatures are generally not severe with the first frost usually occurring in October and freezing temperatures generally not persisting past March. Records since 1870 show that temperatures drop to zero °F or below an average of two or three days per year. Temperatures remain at or below freezing less than 25 days in most years. Summers in the St. Louis area are hot and humid. The long-term record since 1870 indicates that temperatures of 90 degrees Fahrenheit or higher occur on about 35 to 40 days per year. Extremely hot days of 100 degrees Fahrenheit or more generally occur no more than five days per year.

Normal annual precipitation as measured at nearby Lambert Field International Airport based on records dating back to 1871 is a little less than 34 inches. The three winter months are usually the driest, with an average total of approximately 6 inches of precipitation. Average snowfall per winter season is slightly greater than 18 inches. Snowfall of an inch or more is received on five to ten days in most years. Record snowfall accumulation over the past 30 years was 66.0 inches recorded during the 1977 –78 winter season. The spring months of March through May are the wettest with normal total precipitation of just under 10.5 inches. Thunderstorms normally occur 40 to 50 days per year. During any given year, a few of these storms can be classified as severe with hail and damaging wind. Tornadoes have occurred in the St. Louis area.

Between December and April, the predominant wind direction at Lambert Field is from the northwest and west-northwest. Throughout the remainder of the year, the predominant wind direction is from the south. Considering potential differences in topography between Lambert Field and the West Lake Landfill, the actual wind directions at the landfill may be slightly different, possibly skewed in a northeast-southwest direction parallel to the Missouri River valley.

4 DESCRIPTION OF WORK

Additional subsurface investigation may be conducted to provide data to assist in locating and designing a possible subsurface thermal barrier that may be installed in the future, if determined to be necessary, between the North Quarry Landfill and the radiologically-impacted material (RIM) in Area 1. The objective of the subsurface investigation is to assist in locating a suitable alignment for a subsurface barrier for limiting migration of a subsurface smoldering event that may occur in the North Quarry Landfill from migrating into the RIM in Area 1. The subsurface investigations will be performed using a cone penetrometer drilling rig equipped with a cesium-iodide detector for characterization of gamma radiation. The Gamma Cone Penetrometer Testing (GCPT) will provide data on nature and geotechnical properties of the subsurface materials encountered while inclusion of the cesium iodide detector will allow for detection of RIM materials.

The general activities to be conducted during the GCPT investigation in the southern portion of Area 1 include the following:

- Surveying of the proposed GCPT boring locations and the alignments to be used to reach each of the GCPT boring locations;.
- Performance of surficial gamma survey around each of the proposed soil boring locations and along the alignments to be used to access the boring locations;
- Clearing of vegetation as necessary around the GCPT boring locations and along the alignments to be used to reach each of the locations using a forestry mower and/or bulldozer;
- Placement of road base or gravel along the access alignments and around the GCPT boring locations to support vehicle access to each GCPT boring location;
- Clearing of vegetation as necessary, performance of overland gamma survey, and placement of gravel/road base as necessary to allow access to existing location PVC-38 (or others) and performance of downhole gamma logging of PVC-38 (or others) to calibrate the GCPT cesium iodide detector prior to performance of the GCPT investigation;
- Performance of GCPT testing at each boring location; and
- Final surveying of the actual GCPT boring locations.

With the exception of the calibration run(s), all of these activities are expected to be conducted outside of the estimated extent of the radiologically impacted material in Area 1 (Figure 2).

5 HAZARD EVALUATION AND CONTROLS

There exists a limited potential for biological, physical, chemical, and radiological hazards during implementation of the GCPT investigation at the West Lake Landfill site. An activity-specific hazard analysis and control measures to mitigate the potential hazards are included in this section.

5.1 BIOLOGICAL HAZARDS

Possible biological hazards include venomous insects (e.g., bees, wasps, spiders) that can produce allergic reactions; plants such as poison ivy, oak, and sumac that elicit allergic skin reactions in sensitive individuals, and other invertebrates such as fire ants and biting flies which can produce painful irritations. Exposure to these hazards will be minimized with appropriate protective clothing.

5.2 PHYSICAL HAZARDS AND CONTROLS

Physical hazards that may be encountered include:

☒ Slip/trip/fall hazards	☒ Head hazards	☒ Eye hazards
☒ Thermal stresses	☒ Foot hazards	☒ Hand hazards
☒ Mechanical hazards	☒ Electrical hazards	☒ Fire and explosion
☒ Falling objects	☒ Heavy equip hazards	☒ Extreme weather
☒ Excavation hazards	☒ Material handling	☒ High noise levels

Control measures for these physical hazards are provided in Table 2 and in Section 7.

5.3 CHEMICAL HAZARDS AND CONTROLS

5.3.1 Fuel for Equipment

Fuel that will be used during the work activities include diesel fuel and gasoline. In addition to the information below regarding these chemicals, refer to the National Institute for Occupational Safety and Health (NIOSH) Guide to Chemical Hazards.

Chemical Name	Concentration	Exposure Limits REL/PEL (8/10 hr/day; 40 hr/ wk)	IDLH	MSDS if (available)	OSHA Carcinogen	Routes of Exposure *
Diesel fuel	NA	300 ppm	900 ppm	Yes	Yes	Inh, Abs, con
Gasoline	NA	300 ppm	900 ppm	Yes	No	Inh, abs, con

NA – not applicable, REL – Recommended Exposure Limit, PEL – Permissible Exposure Limit, IDLH – Immediately Dangerous to Life & Health, ppm – parts per million, MSDS - material safety data sheet
Routes of Exposure: Inh – Inhalation, Abs – Skin Absorption, Ing – Ingestion, Con – Contact (Skin / Eye)
The Thirteen OSHA –Regulated Carcinogens are found in Appendix B, NIOSH Guide to Chemical Hazards

Material Safety Data Sheets (MSDSs) for diesel fuel and gasoline that include control measures for these fuels are provided in Appendix B.

5.3.2 Landfill Gases

In the unlikely event that landfill gas is encountered during advancement of the cone penetrometer (or drilling of borings, which will be conducted as a future activity), workers should be aware that landfill gas may contain methane, carbon monoxide, hydrogen, carbon dioxide, ammonia, organic compounds, and hydrogen sulfide. The potential fire or explosion hazards from common landfill gas components and health effects from oxygen deficient environments are listed below.

Potential Fire or Explosion Hazards from Common Landfill Gas Components

Component	Potential to Pose a Fire or Explosion Hazard
Methane	Methane is highly explosive when mixed with air at a volume between its Lower Explosive Limit (LEL) of 5 % and its Upper Explosive Limit (UEL) of 15%. At concentrations below 5% and above 15%, methane is not explosive.
Hydrogen	Hydrogen is highly explosive when mixed with air at a concentration between its LEL of 4 % and UEL of 74.5 %.
Carbon Monoxide	Carbon monoxide is explosive when mixed with air at a concentration between its LEL of 12.5 % and UEL of 57 %.
Carbon dioxide	Carbon dioxide is not flammable or explosive.
Nitrogen	Nitrogen is not flammable or explosive.
Oxygen	Oxygen is not flammable, but is necessary to support combustion.
Ammonia	Ammonia is flammable. Its LEL is 15% and its UEL is 28%. However, ammonia is unlikely to collect at a concentration high enough to pose an explosion hazard.
NMOCs	Potential explosion hazards vary by chemical. For example, the LEL of benzene is 1.2% and its UEL is 7.8%. However, benzene and other non-methane organic compounds (NMOCs) alone are unlikely to collect at concentrations high enough to pose explosion hazards.

Hydrogen sulfide	Hydrogen sulfide is flammable. Its LEL is 4% and its UEL is 44%. However, in most landfills, hydrogen sulfide is unlikely to collect at a concentration high enough to pose an explosion hazard.

Health Effects from Oxygen-deficient Environments

Oxygen Concentration	Health Effects
21%	Normal ambient air oxygen concentration
17%	Deteriorated night vision (not noticeable until a normal oxygen concentration is restored), increased breathing volume, and accelerated heartbeat
14% to 16%	Increased breathing volume, accelerated heartbeat, very poor muscular coordination, rapid fatigue, and intermittent respiration
6% to 10%	Nausea, vomiting, inability to perform, and unconsciousness
Less than 6%	Breathing spasms, convulsive movements, and death in minutes

An on-site worker selected by the Project Health and Safety Officer will wear a personal 4-gas meter while conducting project activities. The meter will be capable of monitoring oxygen, explosive gas levels, carbon monoxide, and hydrogen sulfide. If monitoring detects explosive levels of landfill gas 18 inches to 2 feet above the waste surface, work will be halted until the gas dissipates and/or fans are applied to the work area to ensure the gas dissipates before reaching explosive concentrations.

5.3.3 Hazardous Wastes

Volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) might be encountered during advancement of the cone penetrometer (or drilling of borings, which will be conducted as a future activity). A hazard assessment of compounds of concern that might be encountered is provided in Table 3.

Regular monitoring for the presence of VOCs will be conducted by the Project Health and Safety Officer and changes made as necessary to the initial level (Level D; see Section 7.2) of skin and respiratory personal protective equipment (PPE). A photoionization detector (PID) with an 11.7 eV lamp will be used to monitor for VOCs in the breathing zone and the soil surface where the cone penetrometer is being advanced. If drilling of borings is conducted as a future activity, the borehole, any geological samples upon their retrieval, and drill cuttings will also be monitored with the PID. PID and multi-gas monitoring (see Section 5.3.2) will be conducted every 15 minutes for the first 2 hours of a specific activity and then at least every 120 minutes during active work.

To maintain safe working conditions, if vapor concentrations in the breathing zone consistently exceed 5 ppm (instrument gauge units) based on PID measurements, then an upgrade from initial Level D to Level C PPE will be made. Level C PPE will require the addition of a Tyvek suit, disposable nitrile gloves, and a National Institute of Occupational Safety and Health ("NIOSH") approved full-face respirator with organic vapor/acid gas cartridges and dust/mist pre-filters. All personnel performing work in Level C must be fit-tested and trained in the proper use of respirators.

5.3.4 Asbestos

The inhalation of friable asbestos fibers by workers can cause disease of the lungs and other organs that may not appear until years after the exposure has occurred. In the event that friable asbestos is encountered during GCPT activities, the on-site personnel will have been appropriately trained regarding asbestos awareness and recognition. Appropriate personnel will be notified as to the location of confirmed or presumed asbestos containing materials. Any confirmed asbestos containing materials will be handled by personnel with appropriate training to handle such material. Documentation as to the handling procedures and disposition of the friable asbestos containing material will be maintained in the project files.

5.4 Radiological Hazards and Controls

5.4.1 Radiological Hazards

All radiological hazards are associated with the radiologically-impacted soil within Area 1. The radionuclides are primarily comprised of isotopes of thorium and radium and their decay products. Potential exposures from working in and on top of radiologically-impacted soil include:

- External (Direct) Exposure. The radiologically-impacted soil on the surface will emit penetrating radiation in the form of gamma rays.
- Internal Exposure. Internal exposures occur when a worker ingests impacted soil or inhales dust containing radioactive particles.
- Spreading Contamination. It is likely that skin, clothing, and tools that contact radiologically-impacted surface soil within the extent of radiologically-impacted material in Areas 1 and 2 could become contaminated. The dose for such radiological contamination is likely to be very low. To prevent potentially contaminated materials from being carried to vehicles and off-site locations, the materials should be examined with a radiation ratemeter-scaler coupled to a pancake detector (e.g., Ludlum Model 44-9). The standard procedure for monitoring personnel and equipment for radioactive contamination is provided in Appendix C.

5.4.2 Radiological Controls

The purpose of the radiological hazard controls is to lay out procedures that will avoid any significant exposure to the workers involved with the GCPT investigation. During the initial safety meeting, workers will be apprised of the radiological contamination hazard both in extent and degree. The controls to be used to mitigate the hazard will then be presented.

As a general approach, the surveyor will layout the proposed GCPT boring locations and alignments to be used to access the locations. Vegetation clearing will then be conducted along the alignments and around the GCPT boring locations. The Project Health and Safety Officer or Radiation Safety Officer will then walk the cleared alignment and boring locations with a scintillation detector, which measures gamma radiation, to identify any radiological anomalies. The road base/gravel will then be placed over the access alignments and the GCPT boring sites following which, the CPT investigation will be conducted.

There are two primary goals of the GCPT investigation. The first is to locate an alignment for the possible subsurface barrier that is outside of the extent of RIM in Area 1. The second is to locate an alignment as far to the north as possible due to the anticipated lower thickness of refuse the further north from the North Quarry Landfill and the resultant reduced complexity and time necessary for implementation of the subsurface barrier if such a barrier is determined to be necessary. Consequently, although the majority of the proposed GCPT boring location are planned to be located outside of the line where no RIM has previously been identified or is otherwise expected to be present (i.e., the line connecting soil borings that did not contain elevated levels of radionuclides or surface or downhole gamma readings), some of the GCPT borings may be drilled between this line and the interpolated line of the extent of RIM (i.e., the line connecting the midpoints between soil borings with no indications of RIM occurrences and soil borings within observed occurrences of RIM). Therefore, there is a possibility that some of the workers could traverse areas where radionuclides may be present in the surface or subsurface soil.

Because the surveyors, vegetation clearing personnel and gamma scan personnel may potentially enter the radiologically-impacted areas to complete their work, a potential risk exits for these workers for being exposed to radiation. Such exposures will be limited by limiting the amount to which these workers may intrude into the potential areas containing RIM, limiting the amount of time that these workers may be present within the possible areas of RIM, use of appropriate personnel protective equipment (e.g., boots, gloves, safety glasses, etc.) and adherence to the procedures set forth in this HSP in particular the frisking and decontamination procedures. These workers will be required to wear personal dosimetry while completing their work and will be issued a Thermoluminescent Detector (TLD) by the site Radiation Safety Officer. Each TLD will be assigned to a specific individual and can only be worn by that person. Dosimeters will be collected each night by the site Radiation Safety Officer or his delegate and reissued the following day. When a TLD is issued, the recipient will be briefed on the use and care of the dosimeter. Dosimeters shall be worn on the chest area, on or between the waist and the neck. Dosimeters

shall not be exposed to security x-ray devices, excessive heat, or medical sources of radiation. If a dosimeter is lost or damaged, the worker should immediately report the loss to the site Radiation Safety Officer. If the Radiation Safety Officer decides to issue Electronic Personal Dosimeters, they will be collected and read at the end of each shift. Results from Electronic Personal Dosimeters will be considered monitoring data. Doses of record will be determined from the TLDs.

Exposure by other workers is not likely to occur if the anticipated procedures described above to prepare and access the GCPT boring locations (i.e., placement of gravel) and the procedures and precautions delineated in this Health and Safety Plan are followed. It is important that all workers understand they may become exposed if they leave the gravel roads/drill pads and enter the area of RIM occurrences within Area 1 without training and appropriate health and safety equipment and procedures. If a worker suspects that they may have contacted surface soil in a radiologically-impacted area (e.g., soil collected on the bottom of work boots), the potentially contaminated area will be examined with a radiation ratemeter-scaler coupled to a pancake detector. If the scan indicates the collected soil is contaminated, the contaminated surface should be washed with water and the soil/water solution collected in a plastic container or bag.

6 TRAINING

On-site workers will have received hazardous waste operations and emergency response (HAZWOPER) training in accordance with 29 CFR 1910.120. These workers will also have received the radiological safety training required in 10 CFR Part 19 which requires that *"…all individuals who, in the course of their employment, are likely to receive a dose of more than 100 millirem in a year, must receive adequate training to protect themselves against radiation."*. This level of training will be conducted even though exposure, if any, for on-site workers is expected to be much less than 100 millirem.

The radiological safety training will meet typical General Employee Radiological Training (GERT) requirements and include:

- The nature of radioactive materials on the Site;
- Potential routes of exposure;
- Types of controls practiced to minimize exposures; including discussion of any engineering controls, administrative use of time, distance and shielding, and personal protective equipment;
- Types of monitoring used to track potential exposures (periodic area surveys, air monitoring, and use of dosimeters);
- Proper use of instrumentation;
- Incident reporting;
- Availability and use of confidential personal dosimetry records;
- Effects of radiation on humans; and
- Allowable limits (who sets them and what they are).

In addition, on-site workers will have been appropriately trained regarding asbestos awareness and recognition.

All personnel performing work described in this HSP must attend a site/project orientation session, conducted by an FEI representative. The session will cover, at a minimum, site restrictions, health and safety regulations, required personal protective equipment, potential site hazards, constituents of concern, decontamination and emergency procedures. All personnel attending the site/project orientation session must sign the Compliance Agreement provided in Appendix A of this HSP.

Visitors who stay at the site for less than one hour or subcontractors performing routine work not directly related to work described in this HSP (e.g., delivery of equipment and materials) will not require a health and safety orientation.

Each subcontractor must designate a qualified person to be responsible for the health and safety of their employees, and will cooperate with FEI in implementing this HSP.

7 GENERAL HEALTH AND SAFETY PROCEDURES

This section presents general health safety procedures to be followed during the GCPT investigation activities. The measures contained herein will be supplemented as necessary with standard safe work practices.

7.1 ONSITE CONTROL

Onsite control at Areas 1 and 2 of the West Lake Landfill is currently provided by six-foot high chain-link security fences that surround Areas 1 and 2.

7.2 PERSONAL PROTECTIVE EQUIPMENT

The minimum level (Level D) of PPE required for the GCPT investigation will consist of the following:

- Steel-toed boots (mandatory),
- High visibility traffic vest or high visibility work shirt (mandatory);
- Hard hat (mandatory),
- Safety glasses (mandatory),
- Gloves, as necessary based on the specific activity, and
- Hearing protection, as necessary based on the specific activity.

Visitors shall be required to wear PPE equivalent to the above.

7.3 ENVIRONMENTAL MONITORING

If it is suspected that a worker or equipment has contacted soil within the radiologically-impacted areas within Area 1, monitoring of the contacted surface will be conducted with a radiation ratemeter-scaler coupled to a pancake detector by the On-site Health and Safety Officer.

7.4 COMMUNICATION

A cellular telephone will be carried by the On-site Health and Safety Officer at all times. The following standard hand signals will be used in the event that verbal communication becomes impossible:

Hand Signal	Explanation
Hand gripping throat	Out of air, can't breathe
Grip partner's wrist or both hands around waist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	OK, I am all right, I understand
Thumbs down	No, negative

7.5 Safe Work Practices and Limitations

Site Activities will be conducted during daylight hours only. The On-site Health and Safety Officer must provide permission for field work conducted beyond daylight hours or on weekends and holidays. The On-site Health and Safety Officer will review pertinent health and safety matters with onsite personnel in daily health and safety meetings. Additional work practices and limitations are listed as follows:

- All site personnel shall acknowledge in the Compliance Agreement (Appendix A) that they have read, understood, and agree to comply with the HSP.
- In addition to an initial health and safety meeting the project, daily health and safety may be conducted by the On-site Health and Safety Officer at the start of each work day to discuss the day's upcoming activities and to address the health and safety procedures to be followed.
- Applicable OSHA guidelines will be followed for all site activities.
- Dress in accordance with the activity-specific level of protection.
- Smoking will be prohibited except in designated areas.
- Any person under a physician's care, taking medication, or those who experience allergic reactions must inform the On-site Health and Safety Officer.
- If a single individual is working at the site, they must have a cellular phone on their person that is turned on.
- The wearing of contact lenses for onsite personnel is prohibited by best management practice and OSHA.
- Be aware of symptoms of heat or cold stress, exposure to hazardous chemicals or dangerous atmospheres, and work-related injuries. Standard Operating Procedures for Heat Stress are included in Appendix D.
- If trenching activities are conducted, proper excavation and trenching procedures must be followed as outlined in 29 CFR 1926.650 through .653 (Subpart P. Excavations,

Trenching, and Shoring). In particular, the requirements for shoring, sloping, and access/egress must be followed.

- In addition, all underground utilities (gas, electric, water, cable, telephone) at the site must be identified and marked prior to the commencement of any GCPT boring, excavation and/or trenching activity. None are expected to be present in Area 1
- Good personal hygiene practices are especially important when working in the proximity of the potential radiologically-impacted areas within Areas 1 and 2. Of particular importance is the need to keep fingers away from the face unless they have been carefully washed. Cuts and abrasions should be covered by a band-aid.
- All accidents and hazardous material exposure incidents will be reported on the appropriate forms, included in Appendix A.

7.6 HEAVY EQUIPMENT

Working around heavy equipment can be dangerous because of the size and power of the equipment, the limited operatory field of vision, and the noise levels that can be produced by the equipment. The following practices shall be followed by operators when using heavy equipment:

- Equipment should be inspected daily by the operator to ensure that the equipment is in safe operating condition.
- When not in use, hydraulic and pneumatic components should be left in down or "dead" position.
- Roll-over protection shall be provided on uneven terrain sites.
- No riding on vehicles or equipment except in fixed seats.
- Seat belts should be worn at all times.
- Backup alarms, automatically activated and loud enough to be heard above background noise, are required to be operational on all heavy equipment.
- Parking brakes should always be applied on parked equipment.
- Equipment should never be operated closer than 10 feet from utility lines.
- Windshields must be maintained, clean, and free of visual obstructions.

To ensure the safety of personnel in the work area, the following safety procedures regarding heavy equipment must be reviewed prior to and followed during work activities:

- Ensure that equipment operators are trained and/or experienced in the operation of the specific equipment.
- Personnel should never approach a piece of heavy equipment without the operators' acknowledgment and stoppage of work or yielding to the employee.
- Never walk under the load of a bucket or stand beside an opening truck bed.

- Maintain visual contact with the operator when in close proximity to the heavy equipment.
- Wear hearing protection while on or around heavy equipment, when normal conversation cannot be heard above work operations.
- Steel-toed shoes, safety glasses, and a hard hat shall be worn for all work conducted near heavy equipment.

7.7 Heavy Lifting

When lifting objects, use the following proper lifting techniques:

- Keep your feet shoulder width apart to get the best footing possible.
- Bend at the knees, not at the waist.
- Tighten stomach muscles to offset the force of the load.
- Grasp the object at opposite corners.
- Lift with the legs instead of the back muscles.
- Keep the back upright and avoid twisting.
- Most importantly, think before lifting.

7.8 Slip/Trip/Hit/Fall

Slip, trip, hit, and fall injuries are the most frequent of all injuries to workers. They occur for a wide variety of reasons, but can be minimized by the following prudent practices:

- Spot check the work area to identify hazards.
- Establish and utilize a pathway which is most free of slip and trip hazards.
- Beware of trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain.
- Carry only loads which you can see over.
- Keep work areas clean and free of clutter, especially in storage rooms and walkways.
- Communicate hazards to on-site personnel.
- Secure all loose clothing, ties, and remove jewelry while around machinery.
- Report and/or remove hazards.
- Keep safe buffer zones between workers using equipment and tools.

7.9 Electrical Hazards

No individual shall be permitted to work on any part of an electrical power circuit unless the person is protected against electric shock by de-energizing the circuit and grounding it, or by locking and tagging it out:

- All electrical wiring and equipment shall be intrinsically safe for use in potentially explosive environments and atmospheres.
- All electrical wiring and equipment shall be a type listed by Underwriters' Laboratories (UL) or Factory Mutual (FM) for the specific application.
- All installations shall comply with the National Electric Code (NEC) and the National Electric Safety Code (NESC).
- All electrical circuits shall be grounded according to NEC and NESC Code. Ground fault circuit interrupters shall be used in the absence of properly grounded circuitry or when portable tools must be used around wet areas.
- All live wiring or equipment shall be guarded to protect all persons or objects from harm.

7.10 Biological Hazards

Biological hazards include tick-borne diseases and poisonous plants.

7.10.1 Tick-borne Diseases

Lyme disease is caused by a bacterial parasite called spirochete, and is spread by infected ticks that live in and near wooded areas, tall grass, and brush. Once the tick deposits the spirochete, it must feed on the host blood for 12 to 24 hours before it can transmit the disease. The ticks that cause the disease in the Northeast and Midwest are often no bigger than a poppy seed or a comma in a newsprint. The peak months for human infection are June through October. There are many other tick borne diseases such as Rocky Mountain Spotted Fever which can be carried by a variety of ticks. The prevention and treatment of these diseases are similar to those of Lyme disease.

7.10.1.1 Prevention.

Ticks hang on blades of grass or shrubs waiting for a host to come by. When a host brushes against the vegetation, the tick grabs on. They typically climb onto an individual's legs and then crawl up looking to attach in a body crevice. Preventative measures include wearing light-colored clothing, keeping clothing buttoned, tucking pant legs into socks, pulling socks up past the knee, pulling the pant waist up above the naval area with a tight belt, and keeping shirt tails tucked in. Periodic checks for ticks should be made during the day, and especially at night. Hair should also be checked by parting it and combing through it to make sure that no ticks have attached to the scalp. Also, check clothing when it is first removed, before ticks have a chance to crawl off. It is common for ticks to be carried home on clothing and attach to others in the household.

The most common repellent recommended for ticks is N,N-dimethyl-m-toluamide, or DEET. It is important to follow the manufacturer's instructions found on the container for use with all insecticides especially those containing DEET. In general, DEET insect repellent should only be applied to clothing, not directly on the skin. Do not apply to sunburns, cuts or abrasions. Use soap and water to remove DEET once indoors.

7.10.1.2 Removal.

The best way to remove a tick is removal by tweezers. If tweezers are not available, cover your fingers (tissue paper) while grasping the tick. It is important to grasp the tick as close as possible to the site of attachment and use a firm steady pull to remove it. When removing the tick, be certain to remove all the mouth parts from your skin so as not to cause irritation or infection. Wash hands immediately after with soap and water, and apply antiseptic to the area where tick was removed.

7.10.1.3 Testing and Symptoms of Lyme Disease.

A variety of tests exist for determining Lyme Disease infection. However, most of these tests are not exact. The first symptoms of Lyme Disease usually appear from two days to a few weeks after a person is bitten by an infected tick. Symptoms usually consist of a ring-like red rash on the skin where the tick attached. The rash is often bull's eye-like with red on the outside and clear in the center. The rash may be warm, itchy, tender, and/or "doughy". Unfortunately, this rash appears in only 60 to 80 percent of infected persons. An infected person also has flu-like symptoms of fever, fatigue, chills, headaches, a stiff neck, and muscle aches and pains (especially knees). Rashes may be found some distance away from the site of actual attachment. These symptoms often disappear after a few weeks.

7.10.2 Poisonous Plants

Common Poison Ivy (Rhus radicans) grows as a small plant, a vine, and a shrub. Poison Ivy occurs in every state. The leaves always consist of three glossy leaflets. Poison Sumac (Rhus vernix) grows as a woody shrub or small tree 5 to 25 feet tall. It usually contains nine leaves, with eight paired leaves and one on top, and is common in swampy areas. The plants are potent sensitizers and can cause a mild to severe allergic reaction. This reaction is called contact dermatitis.

Dermatitis, in Rhus-sensitive persons, can result from contact with the milky sap found in the roots, stems, leaves, and fruit. The sap may retain its potency for months or years in a dry atmosphere, and can occur during any time of the year. The sap may also be carried by animals, equipment or apparel.

The best form of prevention is to avoid contact. This can occur by wearing long sleeves and gloves if necessary. Disposable clothing, such as Tyvek, is recommended in high risk areas to avoid exposure from contaminated apparel. Barrier creams and cleaners are also recommended.

7.10.3 Fire Prevention

All flammable and/or combustible liquids (i.e., gasoline) will be stored in approved safety containers that meet the specifications of National Fire Protection Association (NFPA) Code 30 and OSHA 29 CFR 1910.106(a)(29). Smoking or open flames are not permitted within 20 feet of any flammable liquid container.

All personnel performing work must be trained in the proper use of fire extinguishers. OSHA-approved, portable fire extinguishers will be located in every field vehicle. These extinguishers are rated for Class A (wood, paper), B (flammable liquid), and C (electrical) fires, and their locations are clearly identified with signs and/or labels. As required by 29 CFR 1910.157(d), at least one fire extinguisher with the appropriate rating must be located within 75 feet of a class A fire hazard and 50 feet of a Class B or C fire hazard.

7.11 Authorized Project Field Personnel

Only authorized project personnel will be granted access to active work areas during field activities. Authorized personnel may include designated representatives from FEI, subcontractors, Republic Services, the U.S. Environmental Protection Agency, and the Missouri Department of Natural Resources. A Log Book will be maintained onsite to record the personnel performing work at or visiting the Site.

7.12 Record Keeping and Reporting

The following records and/or logs will be maintained in the field vehicle of the On-site Health and Safety Officer and will be available for inspection:

- This Health and Safety Plan;
- A Log Book that documents all personnel entering and exiting the Site;
- Accident Report Forms that document any accidents and/or injuries at the Site, including corrective actions; and
- Material Safety Data Sheets that provide health and safety and emergency response information on all chemicals and materials used at the site.

All accidents (including vehicular accidents while traveling to/from the Site), injuries, illnesses, chemical exposures, fires, and/or deviations from the HSP will be reported to the On-site Health and Safety Officer and Project Manager. The On-site Health and Safety Officer must complete an Accident Report Form for all accidents or injuries occurring at the Site. The accident or injury must be reported to the Project Manager and appropriate actions taken.

8 EMERGENCY CONTACTS, PROCEDURES AND CONTINGENCY PLAN

This section includes the telephone numbers for emergency contacts and the procedures to be implemented in the event of an emergency.

8.1 EMERGENCY CONTACTS

In the event of an emergency related to field activities, notification of the appropriate contacts listed on Table 3 should be made.

8.2 HOSPITAL ROUTE

Should the need for emergency medical care arise, the closest medical facility is:

SSM DePaul Health Center
12303 DePaul Drive
St. Louis, MO 63044-2588

A hospital route map is included as Figure 3. Travel time to the hospital from the West Lake Landfill site is approximately 7 minutes. The direct route to SSM DePaul Health Center is as follows:

- Exit the landfill and head SE on St Charles Rock Road (MO 180) toward Taussig Ave;
- Turn Right at Mareschal Lane;
- Take a slight Left at DePaul Circle; and
- Turn Left to stay on DePaul Drive to the SSM DePaul Health Center.

8.3 STANDARD EMERGENCY PROCEDURES

The following standard emergency procedures will be used by onsite personnel. The On-site Health and Safety Officer shall be notified of any onsite emergencies and be responsible for ensuring that the appropriate procedures are followed.

8.3.1.1 Pre Emergency Planning

The provisions of this section of the HSP will be discussed with onsite field personnel during the health and safety orientation meeting.

8.3.1.2 Personnel Injury in the Work Zone

Upon noticing any apparent serious injury, all work must be halted. The On-site Health and Safety Officer should evaluate the nature of the injury. If the accident is deemed serious (i.e., bodily harm has occurred), an ambulance should be requested as the first action item.

8.3.1.3 Fire/Explosion

Proper storage of gasoline and other flammable liquids should be maintained to prevent or avoid spreading of a fire. Upon notification of a fire or explosion onsite, all site personnel should assemble at a designated meeting place and follow the directions below in Sections 8.7 and 8.8.

8.3.1.4 Other Equipment Failure

If any other equipment fails to operate properly, the On-site Health and Safety Officer will be notified to evaluate the effect of this failure on continuing operations onsite. If the failure affects the safety of personnel or prevents completion of the work activities, all personnel will leave the work zone until the situation is evaluated and appropriate actions taken.

8.3.1.5 Site Re-entry

In all situations when an onsite emergency results in evacuation of the work zone, personnel will not re-enter until any of the following conditions have been met, as appropriate:

- The conditions resulting in the emergency have been corrected.
- The hazards have been reassessed by the On-site Health and Safety Officer or a person designated by him.
- The HSP has been reviewed and revised, if necessary.
- Site personnel have been briefed on any changes in the HSP.

8.4 Location of Site Resources

The following items will be maintained in the field vehicle of the On-site Health and Safety Officer used to support each field activity:

- A cellular telephone;
- A copy of this HSP;
- A Log Book;
- Monitoring instrument manuals,
- A copy of the hospital route map and emergency contact list;
- Fire extinguisher;
- Safety supplies, and
- Any other item deemed necessary for personnel health and safety.

8.5 Response Sequence for First Arrivals

If you are the first on the scene, respond as follows:

- Evacuate the incident area (if necessary). Remember that your safety must be the primary consideration;

- Restrict access to the incident area;
- Restrict the use of ignition sources for incidents involving flammable substances;
- Call the On-site Health and Safety Officer or the local emergency response organization. Report the following information:
    - Your name
    - Company affiliation
    - Telephone number from which you are calling
    - Location and type of incident
    - Injuries, if any, and the number and type of injuries
    - Details concerning the substances(s) involved (identification, amount, spill rate, size of area involved), if known
    - If a spill, the direction the spill is moving and the direction the wind may be dispersing airborne contaminants
    - Surficial material on which the spill occurred (i.e., asphalt, gravel, etc.)
    - Any first response action that has been taken
    - The time the incident occurred or when you discovered it
    - Any additional pertinent information
- Notify the On-site Health and Safety Officer after the emergency response team has been contacted; and
- Coordinate with emergency response personnel when they arrive.

8.6 Emergency Response for Severe Weather Conditions

The Environmental Manager for Republic Services shall decide on the continuation or discontinuation of work based on current and pending weather conditions. Electrical storms, strong winds, and tornados are examples of conditions that would call for the discontinuation of work and evacuation of the site. No work will be permitted during any type of electrical storm. This section specifies what should be done in the event of a severe weather emergency, including electrical storms, high winds, heavy rain or hail, and tornados.

8.6.1 Electrical Storms

The procedures include the following:

- Seek shelter in the field vehicles;
- Do not stand near or under high objects.

8.6.2 High Winds

The procedures include the following:

- Seek shelter at the field vehicles;
- Do not drive high profile vehicles at high speeds;

- Park vehicles heading into the wind; and
- Wear safety goggles and a kerchief or dustmask covering your nose and mouth.

8.6.3 Heavy Rain or Hail

The procedures include the following:

- Seek shelter in the field vehicles; and
- Do not attempt to drive a vehicle if you are in an area that is or has the potential for flooding unless you are moving out of a low area.

8.6.4 Tornados

The procedures include the following:

- Seek shelter underground or in a closet, bathroom, or interior wall of a substantial building. Get under something sturdy and cover your head;
- Do not stay in a trailer or vehicle. Leave the trailer or vehicle and lie flat in the nearest ditch if substantial shelter is not available;
- Stay away from large areas of glass; and
- Stay away from large unsupported roofs.

8.7 EMERGENCY RESPONSE FOR FIRES

If a small fire occurs, extinguish it with the fire extinguisher in the field vehicle. Remember to follow these directions to put out the fire:

- Aim at the base of the flame;
- Use the appropriate type of fire extinguisher; and
- Remember that the spray only lasts a few seconds.

If a large fire occurs at the Site, follow these instructions:

- Move flammable and combustible items out of the path of the fire, if such action can be performed safely;
- Call the Fire Department and report the information outlined in Section 8.5;
- Do not attempt to put out a large fire with the field vehicle fire extinguisher;
- Report the incident to the On-site Health and Safety Officer and Project Manager.

8.8 EMERGENCY RESPONSE FOR EXPLOSIONS

If an explosion occurs, follow these instructions:

- Evacuate the site immediately;

- If feasible, decontaminate yourself and others;
- Do not address medical emergencies until you are out of danger;
- Call the On-site Health and Safety Officer or local emergency response organization when you are out of danger to report the incident. Report the information outlined in Section 8.5.

Tables

Table 1 - Project Safety Personnel and Contact Information

Title	Company	Name	Mobile Telephone
Project Manager	FEI	Dan Feezor	(217) 836-8842
Project Health and Safety Officer	FEI	Paul Eastvold	(217) 691-6836
Project Radiation Safety Officer	Auxier & Associates	Mike Bollenbacher	(865) 414-0378
On-site Health and Safety Officer	ConeTech	Rob Coates	(780) 908-1872
Environmental Manager (EM)	Republic Services	Brian Power	(618) 410-0157

Table 2 – Hazard and Control Matrix

Task	Potential Hazard	Control Measures
Driving Safety	• Vehicle traffic • Off-road Hazards (stationary objects, uneven terrain, etc) • Exposure to unfamiliar vehicle, streets, and/or directions • Changes in weather or traffic conditions	• Inspect car and maps before driving • Adjust mirrors and seat positions • Make sure luggage, supplies are secure • Wear seatbelt • Pull over to talk on cell phone • Listen to weather and traffic reports before leaving
Mobilize/Demobilize Equipment to Jobsite	• Insecure loads • Unsafe lifts • Blind spots	• Check load straps and chains after loading and before moving truck • Use spotter when backing vehicles or equipment • Notify workers in the area of planned equipment placement • Have workers move out of path if necessary when spotting equipment • Make eye contact and exchange signals with operator when moving near load • Use level, dry area to unload & store equipment and materials • PPE – Modified Level D, no coveralls required.
General Construction	• Caught between pinch points • Incorrect lifting techniques • Overexertion • Fall, same level • Heat Stress	• Use work gloves if pinch points could be a factor in unloading and loading supplies • Use proper bending/lifting techniques-use your legs, not your back • Ask for help if something is too heavy or uncomfortable to lift alone • Look before you step • Inspect ties for integrity • Take necessary breaks • Consume adequate amounts of fluids • Access pickup beds from the rear of the truck only • Do not jump into or out of pickup beds • PPE – Modified Level D, no coveralls required.

Table 2 – Hazard and Control Matrix (cont.)

Task	Potential Hazard	Control Measures
General Construction, continued	• Slipping and Tripping Hazards	• Travel directly to and from permitted work areas • Walking paths to be kept free of tripping hazards • Extension cords and hoses should be placed together and marked to increase awareness • Care to be taken when walking, especially on wet surfaces. • Use three point contact when getting on or off the equipment • Move equipment to dryer grounds if surface is muddy or has standing water
	• High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work periods) or when ever you must raise your voice for others to hear. (Double hearing protection when $\geq$ 90 dba)
	• Struck by/Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic. • Isolate equipment swing areas • Make eye contact with operators before approaching equipment. • Understand and review hand signals • Warning vests, hard hat, safety glasses and steel toe work boots.
	• Use of Hand Tools	• All tools should be inspected prior to use • No damaged equipment should be used until repaired or replaced. • Damaged equipment must be tagged and taken out of service • Use the proper tool for the task • Know how to use tools safely • Utilize non spark tools around flammable chemicals

Table 2 – Hazard and Control Matrix (cont.)

Task	Potential Hazard	Control Measures
General Construction, continued	• Fueling of Vehicles	• Put vehicle in park or neutral with parking brake set • Turn off engine and remove key from ignition • Smoking is prohibited within 50 feet of fueling operations • Never leave the nozzle unattended. • Do not overfill vehicle tank or container • Never use a cell phone or other personal electronic device while refueling. • Upon exiting vehicle always touch a metal part of the vehicle away from the fill point before handling the nozzle to prevent static discharges.
	• Placing Fuel in Portable Containers	• Use only UL approved portable container with vapor -tight cap • When filling container, follow same rules as when fueling car: turn off engine; extinguish smoking materials, etc…. • Place portable fuel container on the ground during filling, and keep the metal nozzle spout in contact with the container to prevent build up and discharge of static electricity. Never fill a container in the bed of a pickup, in the back of a station wagon, or in the trunk of a car. • Manually control the nozzle valve throughout the filling process. Fill a portable container slowly to decrease the chance of static electricity buildup and minimize spilling or splattering. • Seal contain tightly before loading into vehicle • Secure container in an upright position to prevent sliding or tipping.
	• Horseplay	• Prohibit horseplay anywhere on jobsite • Review rules about horseplay with workers • Remind workers not to respond/participate in horseplay started by others
	• Chemical Exposure	• Avoid inhalation of vapors from fuel • Wash skin with soap and cool water if fuel contacts skin.

Table 2 – Hazard and Control Matrix (cont.)

Task	Potential Hazard	Control Measures
General Construction, continued	• Radiologically-impacted Areas 1 and 2	Untrained workers may not enter radiologically restricted area except during rescue operations. No other access to this area is allowed for any reason. Additional precautions for untrained workers working outside the radiologically restricted area include: • Wear gloves when disturbing or handling soil • No eating, drinking, smoking or using smokeless tobacco products within 50 feet of proposed fence line • Radiation workers may enter with proper preparation and monitoring.
Weather Conditions	• Evaluate prevailing weather conditions for the Site. • Contingency plans developed for likely severe weather conditions such as tornado, and extreme thunderstorm. • Provide for daily weather forecast service in extreme weather areas.	• Employees trained in contingency plan for severe weather conditions. • Weather service contacted regularly during storm conditions. • Supervisory personnel cease operations during extreme storm conditions, personnel evacuate to safe assembly area.
	• Heat Stress • Rain	• Workers are encouraged to increase fluid intake while working. • Workers will increase the frequency and duration of rest breaks while working in heat stress situations. • Workers will watch each other for signs and symptoms of heat exhaustion, fatigue. • If necessary, contractors will plan work in heat stress situations for early morning or evening during hot months. • Implement heat stress control program when necessary • Have proper rain gear available (i.e. Slickers, rubber boots, etc.)

Table 2 – Hazard and Control Matrix (cont.)

Task	Potential Hazard	Control Measures
Biological	• Injuries associated with insects, snakes, spiders and poisonous plants	• Be alert for signs of snakes, insect nests, ant hills and poisonous plants when walking. • Use extreme caution when moving or lifting objects that could be used by snakes or spiders as cover. Always wear leather gloves. • Never reach under or behind objects, or into other areas where snakes may hide. • Workers will tuck pants into socks and wear long sleeves and sturdy leather boots when walking in tall grass to protect against bio hazards. • Workers will use insect repellent when necessary. • Workers will use buddy system to check for signs of insect and spider bites, such as redness, swelling, and flu-like symptoms. • Workers will remove ticks immediately with fine tipped tweezers by grasping the tick as close to your skin as possible and gently pulling straight out. Do not squeeze the tick's body as this may inject fluids into you. Wash the bite area of skin and apply antiseptic. • Workers will immediately wash any areas that were exposed to poisonous plants. • Be aware that oil from poisonous plants can be carried on boots.

Table 3 - Hazard Assessment for Selected Constituents

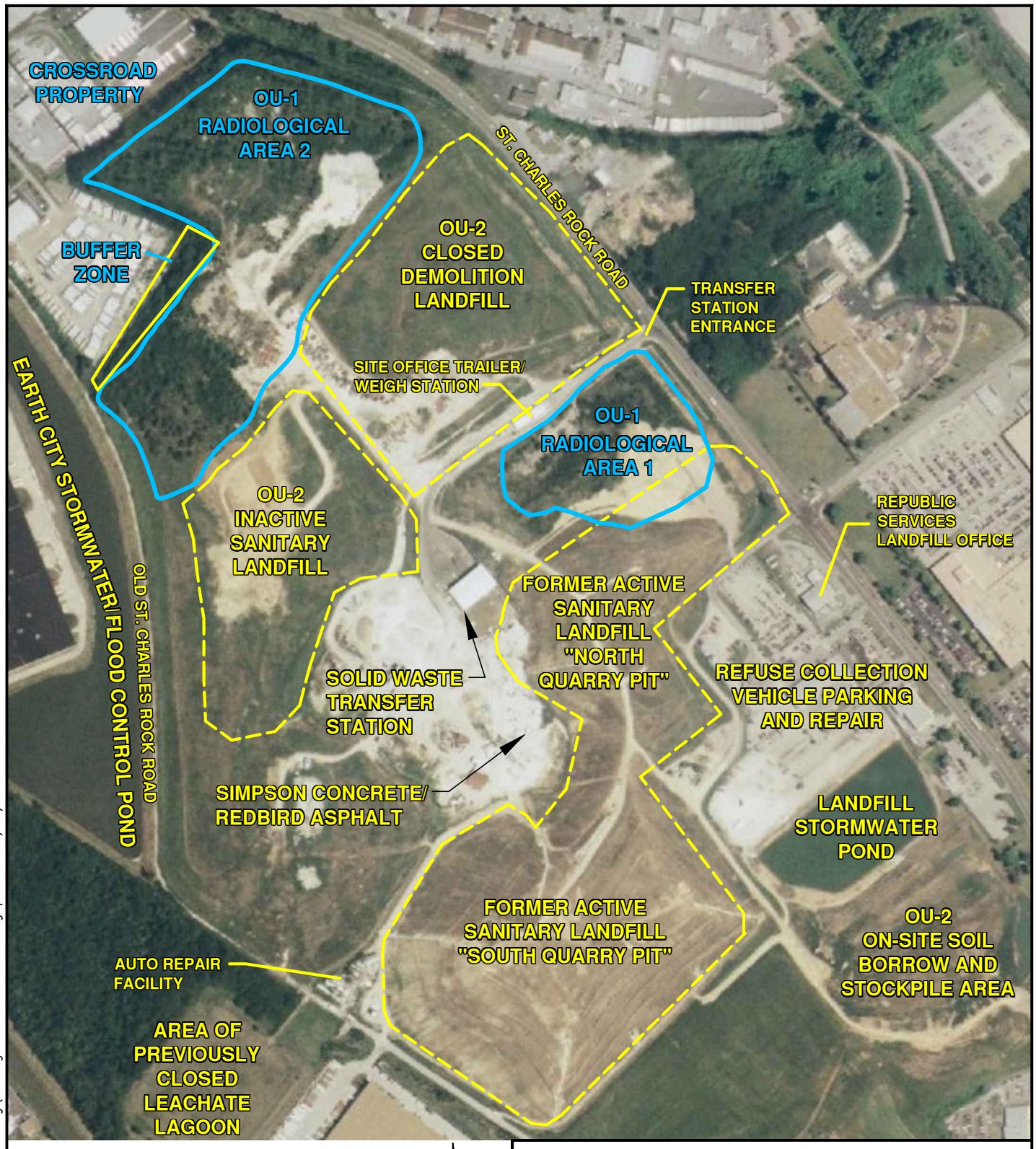
Constituent	CAS No.	TLV (ppm)	STEL (ppm)	Toxic Route of Exposure	CARC	Comments
Methylene chloride	75-09-2	50	--	Vapor inhalation, skin absorption of liquid	CSH	Nonflammable; colorless; odorless; can't smell at <300 ppm
Tetrachloroethene	127-18-4	25	100	Vapor inhalation, skin absorption of liquid	CSH	Nonflammable; colorless; odorless; can't smell at <300 ppm
Toluene	108-88-3	50	150	Vapor inhalation, skin absorption of liquid	No	Flammable; colorless; sweet odor at <10 ppm
Xylenes	1330-20-7 (o-xylene)	100	150	Vapor inhalation, skin absorption of liquid	No	Flammable; colorless; sweet odor at <10 ppm
1,2-Dichloroethene	540-59-0	200	--	Vapor inhalation	No	Acrid odor
1,2-Dichloroethane	107-06-2	1	2	Vapor inhalation, skin absorption of liquid	CSH	Flammable; colorless; sweet odor at <10 ppm
Trichloroethene	79-01-6	50	100	Inhalation, skin absorption	CSA	Nonflammable; colorless; odorless; can't smell at <300 ppm
1,1-Dichloroethane	75-34-3	100	250	Vapor inhalation	No	Vapor
Chloroform	67-66-3	10	2*	Vapor inhalation	CSH	Flammable; colorless; sweet odor at <10 ppm
Vinyl chloride	75-01-4	1	5	Vapor inhalation	CH	No data
Acetone	67-64-1	250	1,000	Vapor inhalation, skin absorption of liquid	No	Flammable; sweet odor
1,1,2-Trichloroethane	79-00-5	10	--	Vapor inhalation, skin absorption of liquid	CSH	Combustible; colorless; sweet odor
Trans 1,2-DCE	540-59-0	200		Vapor inhalation, skin absorption of liquid	CSH	Flammable; colorless; pleasant odor
Cis 1,2-DCE	540-59-0	200		Vapor inhalation, skin absorption of liquid	CSH	Flammable; colorless; pleasant odor
1,1,1,-TCA	71-55-6	350		Irritant to eyes and tissue	No	Nonflammable; colorless
Carbon tetrachloride	56-23-5	5		Vapor inhalation, skin absorption of liquid	CSH	Noncombustible; colorless; sweetish odor
Methyl ethyl ketone	78-93-3	200		Vapor inhalation	No	Flammable; colorless; acetone-like odor
Vinyl acetate	108-05-4	10		Vapor inhalation, skin absorption of liquid	No	Flammable; colorless
Isopropyl alcohol	67-63-0	400		Vapor inhalation, skin absorption of liquid	No	Flammable; colorless; pleasant odor
Chromium	7440-47-3	0.5 mg/m^3		Inhalation; hexavalent chromium carcinogenic and corrosive on tissue	CH	

Notes: CAS No. = Chemical Abstracts Service Number
TLV = Threshold Limit Value; STEL = Short Term Exposure Limit
CARC = Carcinogenicity; CSH = Carcinogenicity suspected for humans; CH = Carcinogenicity established for humans; No = No definite carcinogenicity established.
ppm = parts per million; ug/m^3 and mg/m^3 = micrograms and milligrams per cubic meter, respectively.
-- = not listed in reference source.
* NIOSH (based on 60 minute exposure).
** According to 29 CFR 1910.1017, no employee may be exposed to vinyl chloride at a concentration greater than 5 ppm averaged over any period not exceeding 15 minutes, or 1 ppm over an 8-hour workday.

Table 4 - List of Emergency Telephone Contacts

Agency/Facility	Telephone No.	Contact
Police (Bridgeton Police Department)	911 Emergency (314) 739-7557 non-emergency	
Fire Department (Pattonville Fire Protection District)	911 Emergency (314) 291-6072 non-emergency	
Ambulance (Robertson Fire Protection District)	911	
Emergency Medical Facility/Hospital	(314) 344-6000	SSM DePaul Health Center 12303 DePaul Drive St. Louis, MO 63044-2588
Poison Control Center (Chemtrec)	(800) 424-9300	
Republic Services (On-site Representative and Environmental Manager)	(618) 410-0157 cell (314) 744-8165 office	Brian Power
Feezor Engineering, Inc.	(217) 836-8842 cell (217) 483-3118 office	Dan Feezor
Auxier & Associates (Radiological Health, Safety, and Risk Assessment)	(865) 414-0378 cell	Mike Bollenbacher
ConeTech (GCPT borings)	(780) 908-1872 cell	Rob Coates

Figures



Source: MyTopo.com Date of Photograph 8/9/2007

N

0 600

SCALE IN FEET

Figure 1

West Lake Landfill Features

West Lake Landfill OU-1 Additional Fencing and Signage

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2013\Fencing\WL-Fig-1-Site Features.dwg plotted: 05/15/2013

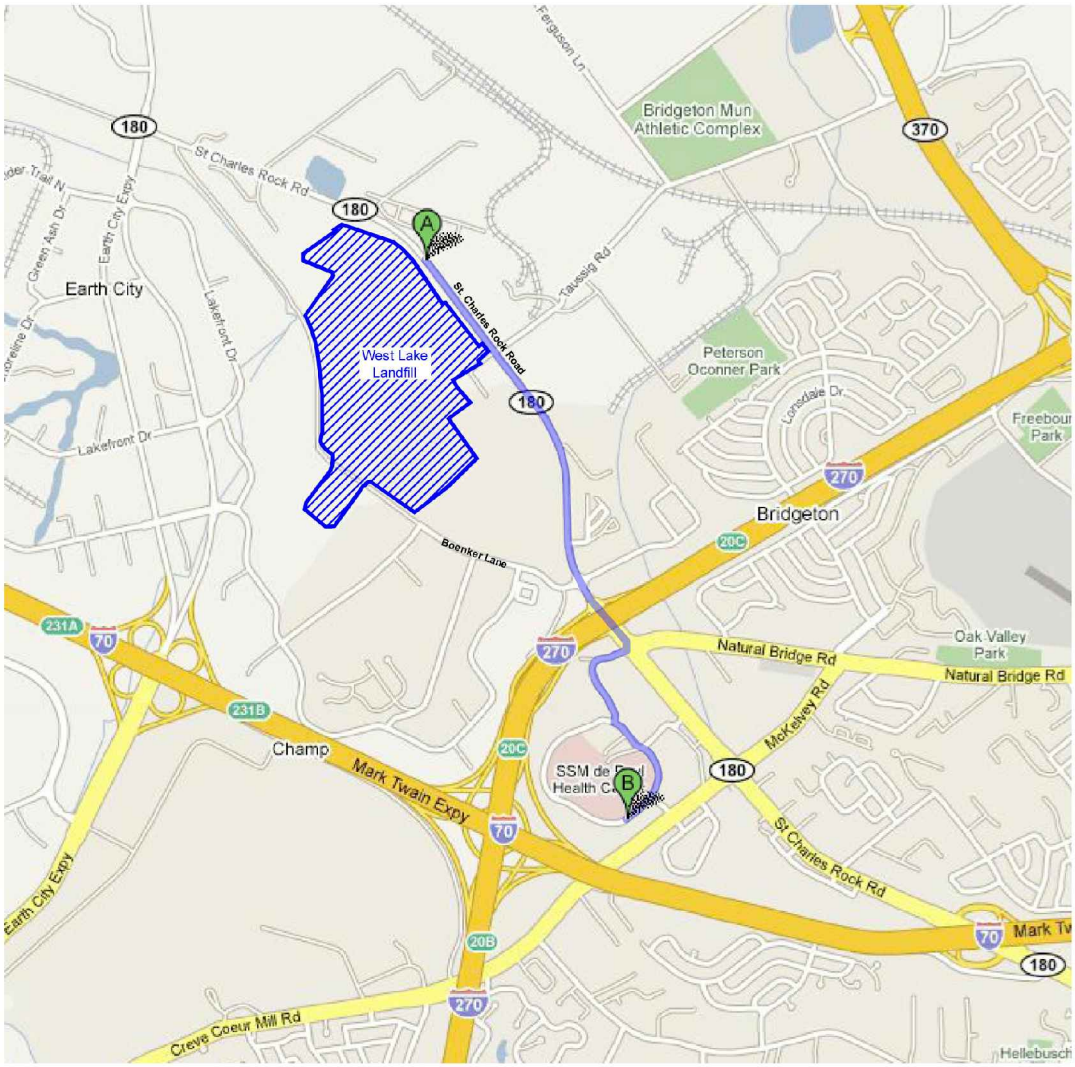
LEGEND

- EXISTING GRADE (2' CONTOUR)
- 500 EXISTING GRADE (10' CONTOUR)
- POTENTIAL BARRIER ALIGNMENT
- GCPT LOCATION
- CLEARING PATH
- ELEVATED DOWNHOLE GAMMA READING
- BOUNDARY OF ELEVATED DOWNHOLE READINGS
- NON-ELEVATED DOWNHOLE GAMMA READING
- BOUNDARY OF NON-ELEVATED DOWNHOLE READINGS
- INTERPOLATED RIM LIMITS
- FENCE

WEST LAKE LANDFILL 13570 ST. CHARLES ROCK ROAD BRIDGETON, MISSOURI 63044	WEST LAKE LANDFILL OU-1 AREA 1 RIM INVESTIGATION	Engineering for a Better World	DATE: JULY 2013 DESIGNED BY: DPE APPROVED BY: DRF	FIGURE
PROPOSED INVESTIGATION		FEEZOR ENGINEERING, INC.	1 9-6-13 PML	**2**
PROJECT NUMBER: BT-012	FILE PATH: P:\Bridgeton Landfill\BT-012 (OU-1 A1 South RIM Determination)\Step 4 - Drawings\BT-012 GCPT INVESTIGATION 2013-09-09 (renumbered From North).dwg		REV # DATE BY	

Google Maps

Directions to 12303 De Paul Dr, Bridgeton, MO 63044
2.1 mi – about **7 mins**



A **13570 St Charles Rock Rd**
Bridgeton, MO 63044

180	1. Head **southeast** on **MO-180/St Charles Rock Rd** toward **Taussig Ave** About 5 mins	go **1.3 mi** total 1.3 mi
↱	2. Turn **right** at **Mareschal Ln**	go **0.1 mi** total 1.5 mi
↖	3. Slight **left** at **De Paul Dr**	go **0.2 mi** total 1.7 mi
↰	4. Turn **left** to stay on **De Paul Dr** Destination will be on the right About 2 mins	go **0.4 mi** total 2.1 mi

B **12303 De Paul Dr**
Bridgeton, MO 63044

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

NOT TO SCALE

N

Figure 3

Directions to Hospital from West Lake Landfill

West Lake Landfill OU-1 Additional Fencing and Signage

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2013\Fencing\WL-Fig-3-Hospital-Dir.dwg plotted: 05/15/2013

Appendix A:

Forms/Logs

Health and Safety Compliance Agreement

I have read, understand, and agree to comply with the health and safety procedures in this Health and Safety Plan (HSP). In addition, I have attended, understand, and agree to comply with the information presented in the health and safety pre-activity meeting. I hereby agree that (1) compliance with the HSP is a condition of entry to the site, and (2) non-compliance with the HSP may result in work stoppage and/or dismissal from the Site.

Printed Name	Organization	Signature	Date

Personnel health and safety pre-activity meeting conducted by:

Name	Organization	Signature	Date

Accident/Incident Report

Date _____ Project Location _____

Description of accident/incident, including injuries, property damage, emergency action taken and personnel involved (use additional sheets if needed):

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Witnesses of Accident/Incident:

_____
_____
_____

Possible or known causes:

_____
_____
_____

What actions are needed to prevent a similar incident?

_____
_____
_____

_____ _____

Reporter On-site Health and Safety Officer

_____

Project Manager

Appendix B:
Material Safety Data Sheets

Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909
US GHS

Synonyms: Ultra Low Sulfur Diesel; Low Sulfur Diesel; No. 2 Diesel; Motor Vehicle Diesel Fuel; Non-Road Diesel Fuel; Locomotive/Marine Diesel Fuel

* * * Section 1 - Product and Company Identification * * *

Manufacturer Information

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

* * * Section 2 - Hazards Identification * * *

GHS Classification:

Flammable Liquids - Category 3
Skin Corrosion/Irritation – Category 2
Germ Cell Mutagenicity – Category 2
Carcinogenicity - Category 2
Specific Target Organ Toxicity (Single Exposure) - Category 3 (respiratory irritation, narcosis)
Aspiration Hazard – Category 1
Hazardous to the Aquatic Environment, Acute Hazard – Category 3

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

DANGER

Hazard Statements

Flammable liquid and vapor.
Causes skin irritation.
Suspected of causing genetic defects.
Suspected of causing cancer.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking
Keep container tightly closed.
Ground/bond container and receiving equipment.

Use explosion-proof electrical/ventilating/lighting/equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Wash hands and forearms thoroughly after handling.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid breathing fume/mist/vapours/spray.

Response
In case of fire: Use water spray, fog or foam to extinguish.
IF ON SKIN (or hair): Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a poison center/doctor if you feel unwell.
If swallowed: Immediately call a poison center or doctor. Do NOT induce vomiting.
IF exposed or concerned: Get medical advice/attention.

Storage
Store in a well-ventilated place. Keep cool.
Keep container tightly closed.
Store locked up.

Disposal
Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
68476-34-6	Fuels, diesel, no. 2	100
91-20-3	Naphthalene	<0.1

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher.

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

First Aid: Skin
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or with waterless hand cleanser. Obtain medical attention if irritation or redness develops. Thermal burns require immediate medical attention depending on the severity and the area of the body burned.

First Aid: Ingestion
DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 - Fire Fighting Measures * * *

General Fire Hazards

See Section 9 for Flammability Properties.

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, and other gaseous agents.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

* * * Section 6 - Accidental Release Measures * * *

Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Prevention of Secondary Hazards

None

* * * Section 7 - Handling and Storage * * *

Handling Procedures

Handle as a combustible liquid. Keep away from heat, sparks, excessive temperatures and open flame! No smoking or open flame in storage, use or handling areas. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

Incompatibilities

Keep away from strong oxidizers.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Component Exposure Limits

Fuels, diesel, no. 2 (68476-34-6)

ACGIH: 100 mg/m3 TWA (inhalable fraction and vapor, as total hydrocarbons, listed under Diesel fuel)
Skin - potential significant contribution to overall exposure by the cutaneous route (listed under Diesel fuel)

Naphthalene (91-20-3)

ACGIH: 10 ppm TWA
15 ppm STEL
Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA: 10 ppm TWA; 50 mg/m3 TWA
NIOSH: 10 ppm TWA; 50 mg/m3 TWA
15 ppm STEL; 75 mg/m3 STEL

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Personal Protective Equipment: Hands

Gloves constructed of nitrile, neoprene, or PVC are recommended.

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	Clear, straw-yellow.	**Odor:**	Mild, petroleum distillate odor
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	0.009 psia @ 70 °F (21 °C)	**Vapor Density:**	>1.0
Boiling Point:	320 to 690 °F (160 to 366 °C)	**Melting Point:**	ND
Solubility (H2O):	Negligible	**Specific Gravity:**	0.83-0.876 @ 60°F (16°C)
Evaporation Rate:	Slow; varies with conditions	**VOC:**	ND
Percent Volatile:	100%	**Octanol/H2O Coeff.:**	ND
Flash Point:	>125 °F (>52 °C) minimum	**Flash Point Method:**	PMCC
Upper Flammability Limit (UFL):	7.5	**Lower Flammability Limit (LFL):**	0.6
Burning Rate:	ND	**Auto Ignition:**	494°F (257°C)

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

Incompatible Products

Keep away from strong oxidizers.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

* * * Section 11 - Toxicological Information * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B: Component Analysis - LD50/LC50

Naphthalene (91-20-3)

Inhalation LC50 Rat >340 mg/m3 1 h; Oral LD50 Rat 490 mg/kg; Dermal LD50 Rat >2500 mg/kg; Dermal LD50 Rabbit >20 g/kg

Potential Health Effects: Skin Corrosion Property/Stimulativeness

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

Potential Health Effects: Eye Critical Damage/ Stimulativeness

Contact with eyes may cause mild irritation.

Potential Health Effects: Ingestion

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

Potential Health Effects: Inhalation

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

This material has been positive in a mutagenicity study.

Carcinogenicity

A: General Product Information

Suspected of causing cancer.

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

B: Component Carcinogenicity

Fuels, diesel, no. 2 (68476-34-6)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans (listed under Diesel fuel)

Naphthalene (91-20-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
NTP: Reasonably Anticipated To Be A Human Carcinogen (Possible Select Carcinogen)
IARC: Monograph 82 [2002] (Group 2B (possibly carcinogenic to humans))

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ general toxicity repeat exposure effects.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Fuels, diesel, no. 2 (68476-34-6)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	35 mg/L [flow-through]	

Naphthalene (91-20-3)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	5.74-6.44 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	1.6 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	0.91-2.82 mg/L [static]	
96 Hr LC50 Pimephales promelas	1.99 mg/L [static]	

96 Hr LC50 Lepomis macrochirus	31.0265 mg/L [static]
72 Hr EC50 Skeletonema costatum	0.4 mg/L
48 Hr LC50 Daphnia magna	2.16 mg/L
48 Hr EC50 Daphnia magna	1.96 mg/L [Flow through]
48 Hr EC50 Daphnia magna	1.09 - 3.4 mg/L [Static]

Persistence/Degradability
No information available.

Bioaccumulation
No information available.

Mobility in Soil
No information available.

* * * Section 13 - Disposal Considerations * * *

Waste Disposal Instructions
See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging
Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 14 - Transportation Information * * *

DOT Information
Shipping Name: Diesel Fuel
NA #: 1993 **Hazard Class:** 3 **Packing Group:** III
Placard:

* * * Section 15 - Regulatory Information * * *

Regulatory Information

Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Naphthalene (91-20-3)

CERCLA: 100 lb final RQ; 45.4 kg final RQ

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product may contain listed chemicals below the de minimis levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right- To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

State Regulations

Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Fuels, diesel, no. 2	68476-34-6	No	No	No	Yes	No	No
Naphthalene	91-20-3	Yes	Yes	Yes	Yes	Yes	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

Component Analysis - WHMIS IDL

No components are listed in the WHMIS IDL.

Additional Regulatory Information

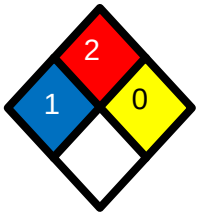
Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Fuels, diesel, no. 2	68476-34-6	Yes	DSL	EINECS
Naphthalene	91-20-3	Yes	DSL	EINECS

* * * Section 16 - Other Information * * *

NFPA® Hazard Rating

Health	1
Fire	2
Reactivity	0



HMIS® Hazard Rating

Health	1*	Slight
Fire	2	Moderate
Physical	0	Minimal
		*Chronic

Key/Legend

ACGIH = American Conference of Governmental Industrial Hygienists; ADG = Australian Code for the Transport of Dangerous Goods by Road and Rail; ADR/RID = European Agreement of Dangerous Goods by Road/Rail; AS = Standards Australia; DFG = Deutsche Forschungsgemeinschaft; DOT = Department of Transportation; DSL = Domestic Substances List; EEC = European Economic Community; EINECS = European Inventory of Existing Commercial Chemical Substances; ELINCS = European List of Notified Chemical Substances; EU = European Union; HMIS = Hazardous Materials Identification System; IARC = International Agency for Research on Cancer; IMO = International Maritime Organization; IATA = International Air Transport Association; MAK = Maximum Concentration Value in the Workplace; NDSL = Non-Domestic Substances List; NFPA = National Fire Protection Association; NOHSC = National Occupational Health & Safety Commission; NTP = National Toxicology Program; STEL = Short-term Exposure Limit; TDG = Transportation of Dangerous Goods; TLV = Threshold Limit Value; TSCA = Toxic Substances Control Act; TWA = Time Weighted Average

Literature References

None

Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

AMERADA HESS CORPORATION

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades **MSDS No. 9950**

EMERGENCY OVERVIEW
DANGER!
EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT - EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED - ASPIRATION HAZARD

NFPA 704 (Section 16)

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

1. CHEMICAL PRODUCT and COMPANY INFORMATION (rev. Jan-04)

Amerada Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): **CHEMTREC (800)424-9300**
COMPANY CONTACT (business hours): Corporate Safety (732)750-6000
MSDS Internet Website www.hess.com/about/environ.html

SYNONYMS: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS * (rev. Jan-04)

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

3. HAZARDS IDENTIFICATION (rev. Dec-97)

EYES
Moderate irritant. Contact with liquid or vapor may cause irritation.

SKIN
Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION
Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY
Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES (rev. Dec-97)

EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION
DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION
Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES (rev. Dec-97)

FLAMMABLE PROPERTIES:

FLASH POINT:	-45 °F (-43°C)
AUTOIGNITION TEMPERATURE:	highly variable; > 530 °F (>280 °C)
OSHA/NFPA FLAMMABILITY CLASS:	1A (flammable liquid)
LOWER EXPLOSIVE LIMIT (%):	1.4%
UPPER EXPLOSIVE LIMIT (%):	7.6%

FIRE AND EXPLOSION HAZARDS

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 “Low Expansion Foam - 1994 Edition.”

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES (rev. Dec-97)

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product

vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE (rev. Dec-97)

HANDLING PRECAUTIONS

******USE ONLY AS A MOTOR FUEL******
******DO NOT SIPHON BY MOUTH******

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION (rev. Jan-04)

EXPOSURE LIMITS

Component (CAS No.)	Exposure Limits			
	Source	TWA (ppm)	STEL (ppm)	Note
Gasoline (86290-81-5)	ACGIH	300	500	A3
Benzene (71-43-2)	OSHA	1	5	Carcinogen
	ACGIH	0.5	2.5	A1, skin
	USCG	1	5	
n-Butane (106-97-8)	ACGIH	800	--	2003 NOIC: 1000 ppm (TWA) Aliphatic Hydrocarbon Gases Alkane (C1-C4)
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	--	
	ACGIH	1000	--	A4
Ethyl benzene (100-41-4)	OSHA	100	--	
	ACGIH	100	125	A3

Component (CAS No.)	Exposure Limits			
	Source	TWA (ppm)	STEL (ppm)	Note
n-Hexane (110-54-3)	OSHA	500	--	
	ACGIH	50	--	skin
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)
	ACGIH	50	--	A4 (skin)
1,2,4- Trimethylbenzene (95-63-6)	ACGIH	25	--	
Xylene, mixed isomers (1330-20-7)	OSHA	100	--	
	ACGIH	100	150	A4

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem ®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES (rev. Jan-04)

APPEARANCE

A translucent, straw-colored or light yellow liquid

ODOR

A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

ODOR THRESHOLD

	Odor Detection	Odor Recognition
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	85 to 437 °F (39 to 200 °C)
VAPOR PRESSURE:	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)
VAPOR DENSITY (air = 1):	AP 3 to 4
SPECIFIC GRAVITY (H_2O = 1):	0.70 – 0.78
EVAPORATION RATE:	10-11 (n-butyl acetate = 1)
PERCENT VOLATILES:	100 %

SOLUBILITY (H_2O): Non-oxygenated gasoline - negligible (< 0.1% @ 77 ^oF). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 ^oF); ethanol is readily soluble in water

10. STABILITY and REACTIVITY (rev. Dec-94)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

INCOMPATIBLE MATERIALS

Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

11. TOXICOLOGICAL PROPERTIES (rev. Dec-97)

ACUTE TOXICITY

Acute Dermal LD50 (rabbits): > 5 ml/kg
Acute Oral LD50 (rat): 18.75 ml/kg
Primary dermal irritation (rabbits): slightly irritating
Draize eye irritation (rabbits): non-irritating
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY

Carcinogenicity: OSHA: NO IARC: YES - 2B NTP: NO ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

12. ECOLOGICAL INFORMATION (rev. Jan-04)

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API (www.api.org) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

13. DISPOSAL CONSIDERATIONS (rev. Dec-97)

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION (rev. Jan-04)

DOT PROPER SHIPPING NAME:	Gasoline
DOT HAZARD CLASS and PACKING GROUP:	3, PG II
DOT IDENTIFICATION NUMBER:	UN 1203
DOT SHIPPING LABEL:	FLAMMABLE LIQUID

PLACARD:

15. REGULATORY INFORMATION (rev. Jan-04)

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow-up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION WT. PERCENT
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents (www.epa.gov/tri) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION - Parts per million (ppm) by weight
Polycyclic aromatic compounds (PACs)	17
Benzo (g,h,i) perylene (191-24-2)	2.55
Lead (7439-92-1)	0.079

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)
Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

16. OTHER INFORMATION (rev. Jan-04)

NFPA® HAZARD RATING	HEALTH:	1	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
HMIS® HAZARD RATING	HEALTH:	1 *	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
	* CHRONIC		

SUPERSEDES MSDS DATED: 12/30/97

ABBREVIATIONS:

AP = Approximately < = Less than > = Greater than
N/A = Not Applicable N/D = Not Determined ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute (212)642-4900
API	American Petroleum Institute (202)682-8000
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation [General Info: (800)467-4922]
EPA	U.S. Environmental Protection Agency
HMIS	Hazardous Materials Information System
IARC	International Agency For Research On Cancer
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association (617)770-3000
NIOSH	National Institute of Occupational Safety and Health
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)
NTP	National Toxicology Program
OPA	Oil Pollution Act of 1990
OSHA	U.S. Occupational Safety & Health Administration
PEL	Permissible Exposure Limit (OSHA)
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit (NIOSH)
SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
SCBA	Self-Contained Breathing Apparatus
SPCC	Spill Prevention, Control, and Countermeasures
STEL	Short-Term Exposure Limit (generally 15 minutes)
TLV	Threshold Limit Value (ACGIH)
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average (8 hr.)
WEEL	Workplace Environmental Exposure Level (AIHA)
WHMIS	Workplace Hazardous Materials Information System (Canada)

Appendix C:
Standard Procedure for Monitoring for Radioactive Contamination

PROCEDURE 2.7
MONITORING PERSONNEL AND EQUIPMENT FOR RADIOACTIVE CONTAMINATION

1.0 PURPOSE

1.1 To describe the general approach for monitoring personnel and equipment for radioactive contamination.

2.0 RESPONSIBILITIES

2.1 The Site Survey Manager is responsible for assuring that this procedure is implemented.

2.2 Survey team members are responsible for following this procedure.

3.0 PROCEDURE

3.1 Upon exiting potentially contaminated areas, monitoring of clothing and exposed skin surfaces will be performed. Equipment and materials will also be monitored and shown to be free of contamination before release for use without radiological restrictions or controls.

3.2 Equipment

3.2.1 Ratemeter-scaler: Model 3 or Model 2221, Ludlum Measurements, Inc.; or equivalent, equipped with audible speaker or headphones.

3.2.2 Detector: Selected detectors are indicated below. Equivalent detectors are also acceptable.

Activity	Detector Type	Model
Alpha	ZnS scintillator	Ludlum 43-1 or 43-5, Eberline AC3-7 or AC3-8
	Gas proportional	Ludlum 43-68, Ludlum 239-1
Beta	Gas proportional	Ludlum 43-68, Ludlum 239-1
	Geiger-Mueller	Ludlum 44-9, Eberline HP-260

3.2.3 Instrument cables

3.2.4 Check sources

3.2.5 Record Forms and/or field logbook

3.3 Quality Control Check

Assemble instrument, turn on, check battery, and adjust high voltage and threshold, if necessary. Check background and source responses following Procedure 2.1.

3.4 Surface Scanning

3.4.1 Headphones or other audible signal operating modes are used for scanning.

3.4.2 Set the instrument response for "FAST", response where possible.

3.4.3 Pass the detector slowly over the surface. The detector should be kept as close to the surface as conditions allow. The speed of detector movement will vary depending upon the radionuclide of concern and the experience of the surveyor. While scanning for alpha or beta activity, the detector is typically moved about one detector width per second.

3.4.3 Note increases in count rate as indicated by the audible meter output. Identifiable increases in the audible response suggest possible contamination and should be resurveyed at a slower rate to confirm findings.

3.5 Personnel Monitoring

3.5.1 When monitoring for skin or clothing contamination, give particular attention to the hands, shoes, pant and shirt cuffs, knees, and other surfaces which have a high likelihood of contamination.

3.5.2 If there is detectable contamination, it should be removed as directed by the Health and Safety Committee (HSC) Chairperson. Decontamination guidance will be provided in the Survey Work Plan. The Site Safety Officer will implement decontamination or other contamination control actions at the project site.

3.6 Equipment Monitoring

3.6.1 For equipment surveys, attention should be given to monitoring cracks, openings, joints, and other areas where contamination might accumulate.

3.6.2 Measure levels of total and removable surface contamination (see Procedures 2.3 and 3.6) at locations of elevated direct radiation identified by the scan and at additional representative surface locations.

3.6.3 Acceptable surface contamination levels will be established on a project-specific basis, with details, including decontamination instructions, provided in the Survey Work Plan.

3.7 Document results of contamination surveys in field records

PROCEDURE 2.3
DIRECT RADIATION MEASUREMENT

1.0 PURPOSE

1.1 To describe the method for measuring total alpha and beta radiation levels on equipment and building surfaces.

2.0 RESPONSIBILITIES

2.1 The Site Survey Manager is responsible for assuring that this procedure is implemented.

2.2 Survey team members are responsible for following this procedure.

3.0 PROCEDURE

3.1 Equipment

3.1.1 Ratemeter-scaler: Model 3, Model 2220 or 2221, Ludlum Instrument Corporation; or equivalent

3.1.2 Detector: Selected detectors are listed below: Equivalent detectors are also acceptable

Activity	Detector Type	Model
alpha	ZnS scintillator	Ludlum 43-1 or 43-5, Eberline AC3-7 or AC3-8
	gas proportional	Ludlum 43-68
beta	Geiger-Mueller	Ludlum 44-9, Eberline HP-260
	gas proportional	Ludlum 43-68

3.1.3 Cables

3.1.4 Check source

3.1.5 Record forms

3.2 Quality Control Check

3.2.1 Assemble instrument, turn on, check battery, and adjust high voltage and threshold, if necessary. Check background and check source responses. Follow the procedures described in Procedure 2.1.

3.3 Direct Measurement

3.3.1 When applicable, team members performing instrument checks will calculate the average and maximum "field action levels" for instrument combination based on the specific site criteria and background.

Action level (cpm) = [site criteria (dpm/100 cm^2) x E x G x T] + B

T = count time (minutes)
E = operating efficiency (counts/disintegration)
G = geometry (total detector area (cm^2)/100)

	Total Area	Active Area
43-5 detector area =	80 cm^2	60 cm^2
43-1 detector area =	80 cm^2	50 cm^2
43-68 detector area =	126 cm^2	100 cm^2
44-9 detector area =	20 cm^2	15.5 cm^2
HP-260 detector area =	20 cm^2	15.5 cm^2

B = background (cpm)

A field count at or above this value indicates that further investigation in this location is necessary.

NOTE: For a particular site, the action level may be established as any activity exceeding background.

3.3.2 Select an appropriate counting time. A counting time is desired which will achieve a minimum detectable activity (see Procedure 4.2) value less than 50% of the applicable criteria. For most radionuclides a 1-minute count, using the instruments listed above, is adequate to achieve this sensitivity. For radionuclides having guidelines of 5000 dpm/100 cm^2, average and 15,000 dpm/100 cm^2, maximum, 0.5 minute counting times may be acceptable.

3.3.3 Place the detector face in contact with the surface to be surveyed. The detector face is typically constructed of a very thin and fragile material, so care must be exercised to avoid damage by rough surfaces or sharp objects. (Scans should have been performed, prior to this point, to identify representative locations and locations of elevated direct surface radiation for measurement.)

3.3.4 Set the meter timer switch, press the count-reset button, and accumulate the count events until the meter display indicates that the count cycle is complete.

3.3.5 Record the count and time on the appropriate record form.

3.3.6 If the location has a surface activity level above background, the area around the measurement locations should be scanned to determine the homogeneity of the measured activity level in the area. Dimensions and activity levels of inhomogeneities should be documented on the appropriate record form.

3.3.7 The surface activity may be calculated according to Procedure 4.3.

PROCEDURE 3.6
REMOVABLE ACTIVITY SAMPLING

1.0 PURPOSE

1.1 To provide guidelines for measuring removable alpha and beta radioactivity on equipment and building surfaces.

2.0 RESPONSIBILITIES

2.1 The Site Survey Manager is responsible for assuring this procedure is implemented.

2.2 Survey team members are responsible for following this procedure.

3.0 PROCEDURE

3.1 Equipment and Materials

3.1.1 Smears, Mazlin wipes, filter papers (like Whatman 47 mm dia. glass fiber) or equivalent

3.1.2 Glassine or paper envelopes

3.1.3 Record forms

3.1.4 Counting equipment

3.2 Sample Collection

NOTE: Direct measurements will be completed before a smear sample is taken.

3.2.1 Grasp the smear (filter) paper by the edge, between the thumb and index finger.

3.2.2 Applying moderate pressure with two or three fingers, wipe the numbered side of the paper over approximately 100 cm^2 of the surface.

3.2.3 Place the filter in an envelope.

3.2.4. Record the smear number, site, date, location of the smear, and name of sample collector on the envelope.

3.2.5 Label and secure in accordance with Procedures 3.7 and 3.8. Record pertinent information on the Chain-of-Custody Form.

3.2.6 If the direct measurement was elevated, the smear should be monitored (procedures 2.2 and 2.3) to determine whether contaminated material was transferred to the smear. If an activity level greater than 250 cpm is detected, the smear envelope should be marked as such.

NOTE: Smears having activity levels greater than 2500 cpm should be counted using field instrumentation. Decisions regarding further analyses and method of disposal of contaminated smears will be made by the PM and SSM on a case-by-case basis.

3.3 Field Sample Measurement

3.3.1 If the object of the survey is to determine if radon or thoron daughter products or other short half-life radionuclides are present, the smears should be counted within 1-2 hours before significant decay of short-lived radionuclides has occurred.

3.3.2 If necessary, smears can be counted in the field using portable instrumentation (see Procedure 2.3).

3.3.3 Record count and counting time data on the appropriate record form.

3.3.4 Subtract the background count (determined by counting blank or unused smear) and convert net count to dpm/100 cm^2, using proper time and detector efficiency values.

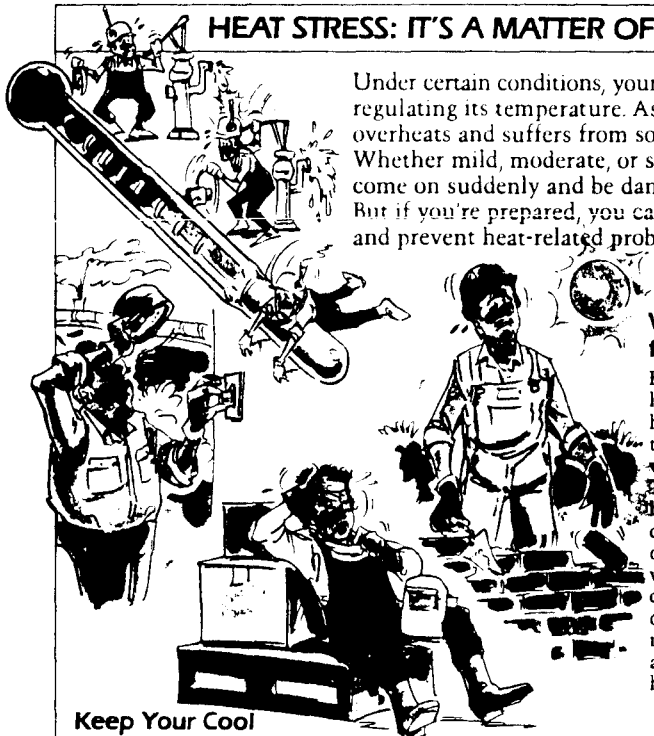
$$\frac{DPM}{100\,CM^2} = \left(\frac{NETCOUNT}{TIME(\text{MIN}) * EFFICIENCY * \left(\frac{COUNT}{DISINTEGRATION} \right) * OTHERMODIFIYINGFACTORS} \right)$$

Appendix D:
Understanding and Preventing Heat Stress

UNDERSTANDING AND PREVENTING

HEAT STRESS

HEAT STRESS: IT'S A MATTER OF DEGREE



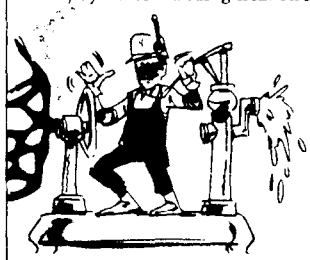
Under certain conditions, your body may have trouble regulating its temperature. As a result, your body overheats and suffers from some degree of heat stress. Whether mild, moderate, or severe, heat stress can come on suddenly and be dangerous to your health. But if you're prepared, you can "keep your cool" and prevent heat-related problems.

When It's Too Hot for You to Handle

Hard work or play can overload your body with extra heat—especially if you're active in a hot, humid, or poorly ventilated environment. These conditions make it harder for your body to handle heat—the sweat pours out, you don't feel well or work well, and you may feel dizzy or faint. If these signs of heat stress go unrecognized and untreated, serious—and sometimes permanent—health problems can occur.

Keep Your Cool

Our bodies vary in their ability to handle heat. But everyone can learn to avoid the adverse health and safety effects of heat stress. Keep your cool by knowing your body and its limitations, by understanding heat stress, and by preventing heat stress in the first place.



Know Your Body

Your body has a "heat regulator" that controls body temperature. But activity, heat, humidity, or lack of air movement can overwork this mechanism.

Understand Heat Stress

Protect yourself from heat stress. Learn to recognize warning signs—such as heavy sweating, fatigue, and dizziness—and know how heat stress is treated.

Prevent Heat Stress

Take an active role to prevent heat problems. Know the factors that increase your risk and take steps to reduce them, such as drinking water and acclimatizing to the heat.

HOW YOUR BODY HANDLES HEAT

You have a natural mechanism that regulates the **core temperature** deep inside your body. You maintain a normal core temperature of 98.6° F by releasing excess heat into the air. The heat leaves your body through the blood vessels near the skin's surface and through the evaporation of sweat. Your level of activity and certain environmental conditions make the regulator work harder to increase your body's blood flow and sweat production.

Blood Flow

Your regulator tells the blood vessels near the surface of your skin to expand. The extra blood brings more body heat to the surface and releases it into the air. To keep your cool, your body needs enough water and minerals, such as salt, to keep its blood vessels supplied with blood.

Sweat Production

If increased blood flow alone isn't enough, your regulator also steps up production of sweat. This allows more heat to be carried away through evaporation. You can lose up to one quart of water, plus important minerals such as salt, each hour you sweat—water which must be replaced to keep you feeling well and healthy.

Activity

The more active you are, the more heat your muscles generate. Heavy physical activity also sets up competition between your muscles and skin for the blood supply.

Air Movement

Air moving across your skin carries away heat from its surface; it also helps sweat evaporate. But with little air movement, these processes don't work as well.

Environmental Temperature

As the temperature in your environment goes up, so does your body temperature. When it's hot from the sun or other radiant heat source, such as a furnace, your body can't transfer heat to the air as effectively.

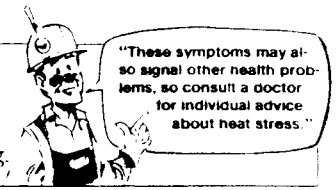
Humidity

The higher the humidity, the less sweat evaporates. That's because the moisture content in the air is already high, making it difficult for the air to absorb more moisture.

"When these conditions prevent me from regulating your body's temperature, you're in danger of having heat stress."

UNDERSTAND HEAT STRESS

When your body's heat regulator is pushed too far and your body overheats, some form of heat stress occurs. It may be mild, moderate, or severe; symptoms may range from excessive sweating to dizziness to unconsciousness. Since even severe heat stress can appear suddenly, learn the warning signs and how they're treated, so you can be more comfortable and productive, and prevent heat problems from occurring.



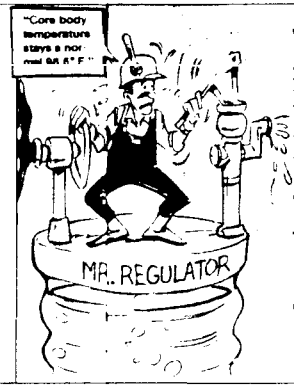
Mild: Minor Heat Problems

This is usually the earliest and least serious form of heat stress. Mild heat stress is always reversible and usually isn't dangerous unless the symptoms persist. Although you usually can continue work soon after treatment, always inform your supervisor if you have symptoms of mild heat stress.

Signs and Symptoms

You may have one or more of these symptoms.

- Excessive sweating.
- Painful spasms in muscles during or several hours after activity **(heat cramps).**
- Tiny red bumps on skin and a prickling sensation **(called prickly heat).**
- Irritability, mild dizziness, or weakness.



What's Going On

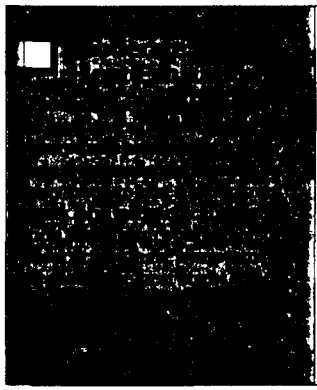
Sweating causes your body to lose too much water and minerals. This imbalance may cause muscles to cramp. Your sweat glands may become blocked and inflamed, causing a rash. Too little blood flowing to the brain causes irritability, dizziness and other symptoms.

Treatment

Follow this self-care:

- Rest in a cool or shady area.
- Drink water or other fluids.
- Use warm, moist compresses over cramping muscles, followed by gentle massage.
- Use a mild drying lotion to relieve the rash; keep skin dry and clean.

Taking additional salt is usually **not** necessary.



Signs and Symptoms

You may have one or more of these symptoms.

- Excessive sweating.
- Cold, moist, pale skin (or flushed skin).
- Thirst.
- Extreme weakness or fatigue.
- Headache, nausea, or loss of appetite.
- Dizziness or giddiness.
- A rapid, weak pulse.

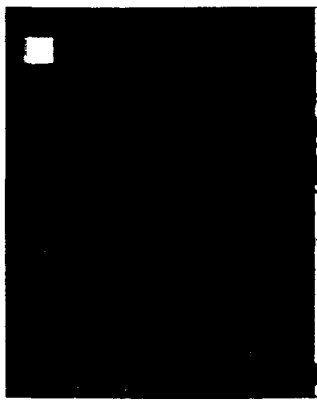
What's Going On

Losing too much water and minerals reduces the blood supply to major organs, such as the brain, muscles, and skin. Your heart works harder to maintain the blood supply, straining your cardiovascular system. Some organs, such as the brain, may not get enough blood.

Treatment

You may need medical treatment, as well as this self-care:

- Rest in a cool or shady area.
- Drink water or other fluids.
- Take additional salt only if advised.
- Use cool compresses on forehead, around the neck, and under armpits.



Signs and Symptoms

You may have one or more of these symptoms.

- Lack of sweating.
- Hot, dry, flushed skin.
- Deep, rapid breathing.
- A rapid, weak, and possibly irregular pulse.
- Headache, nausea.
- Dizziness, confusion, or delirium.
- Loss of consciousness.
- Convulsions.

What's Going On

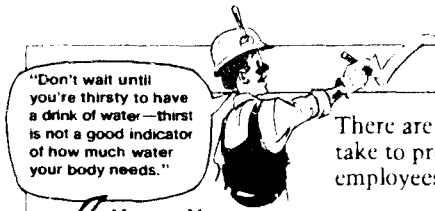
Your regulator becomes so overburdened that blood flow and sweat cannot cool your body enough. Your body becomes so overheated that sweat glands and other organs don't function normally. This can affect vital organs, including your heart and brain, and may cause permanent damage.

Treatment

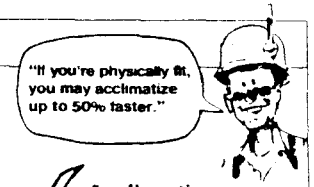
Call for medical help right away. While waiting for medical treatment, begin first aid:

- Rest in a cool or shady area.
- Remove outer clothing.
- Lower body temperature with cool compresses, increasing air movement, or both.
- Drink water or other fluids (if conscious).

CHECKPOINTS FOR PRE VENTING HEAT STRESS



There are several steps you and your employer can take to prevent heat stress. Both supervisors and employees can recognize risks and follow safety procedures to reduce them. Be sure to inform your employer about any medical conditions you have and discuss whether you might be at increased risk.



Know Your Environment

Your company controls the work environment so it's safe. You can help by knowing which factors increase your risk of heat stress. Talk with your supervisor about ways to reduce them, so you can take special precautions to protect yourself when the risk is especially high, such as on hot, humid days.

Drink Plenty of Water

Increase the water you drink to replenish the water you lose from sweating. Drink more than you need to satisfy your thirst. It's best to replenish regularly by drinking small amounts frequently throughout the day. You may need to drink a glass of water or more every hour.

Take Appropriate Breaks

Whether you need rest breaks depends on conditions such as air temperature, sun exposure, and how hard you're working. Your company monitors these conditions and establishes a safe work/rest regimen for you and your coworkers.

Wear Proper Clothing

Your employer supplies you with heat-protective clothing and equipment, such as heat shields, if needed. When possible, wear loose, lightweight clothing, which encourages heat to be released.

Acclimatize Yourself

Your employer may give you guidelines to help you adapt to the heat. This natural process, called **acclimatization,** takes about 7 to 10 days. It usually consists of short periods of working in the heat, which gradually increase in time and intensity. If you spend time out of the heat due to vacation or reassignment, you may need to acclimatize yourself again.

Stay in Good Shape

Conditioned muscles work more efficiently and generate less body heat, while extra body weight makes you work harder. People in good condition tend to acclimatize better because their cardiovascular systems respond better.

Eat Wisely

Hot, heavy meals add heat to your body and divert blood to your digestive system, so eat lightly during your workday. Remember, too, a normal diet usually supplies all the salt you need to replace the salt lost through sweating.

Know Special Risks

Alcohol (including beer), **caffeine, medications** such as those used to control high blood pressure or allergies, **medical conditions** including diabetes, **recent illnesses** such as flu, and increasing **age** all increase your risk of heat stress.

"TEAMWORK HELPS YOU BEAT THE HEAT"

In many jobs, heat is a fact of life. Since too much heat can be harmful to your health and be a safety problem, your company wants to help you reduce the risk of heat stress by monitoring and controlling the work environment. Be sure to follow company procedures, such as adjusting gradually to working in the heat and drinking plenty of water. You'll feel better on and off the job knowing what heat stress is and how to prevent it.

KRAMES COMMUNICATIONS
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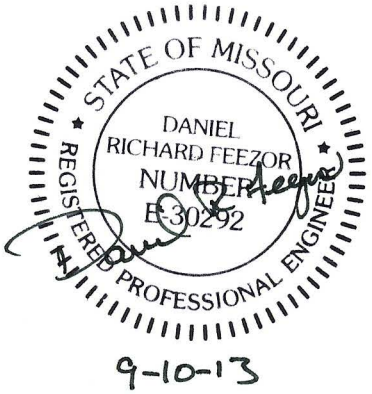
ENGINEERING FOR A BETTER WORLD
FEEZOR
ENGINEERING, INC.

BRIDGETON LANDFILL—WEST LAKE LANDFILL

GAMMA CONE PENETRATION TEST (GCPT)
WORK PLAN
REVISION 1

BRIDGETON, ST. LOUIS COUNTY, MISSOURI



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September 10, 2013

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Bridgeton Landfill, LLC

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1 INTRODUCTION

A detailed subsurface investigation is proposed in Area 1 of Operable Unit 1 of the West Lake Landfill Superfund Site in order to identify the optimum location and obtain geotechnical data for a possible contingent isolation barrier immediately to the north of the Bridgeton Landfill - North Quarry Area. The investigation is the first step in a process that may ultimately lead to the construction of the thermal barrier. Table 1 presents a preliminary plan and schedule for this process.

This document prescribes the location, technology, and methodology of this investigation. In particular, Cone Penetration Testing is selected for gathering detailed data to evaluate the southern extent of impacted material.

1.1 SITE CONDITIONS

In the 1970's West Lake Landfill received contaminated waste, including soil mixed with leached barium sulfate residues containing traces of uranium, thorium and their long-lived daughter products. The presence of the radiologically impacted material (RIM) resulted in the West Lake Landfill being designated as a Superfund site. For purposes of this Work Plan, RIM will refer to radiologically impacted material present at a level above that deemed appropriate for unrestricted use (5 pCi/g above background). The RIM is located in two areas at the site: Area 1, which is adjacent to the North Quarry Landfill and thus is pertinent to this investigation; and Area 2, which is located along the northern portion of the site. Area 2 is approximately 1,000 feet (at the closest) from the outer boundary of the North Quarry Area and is separated from it by a road and a closed demolition landfill (Figure 1). Collectively, these two areas have been designated as Operable Unit 1 for the Superfund investigation and remediation activities while the rest of the site was designated as Operable Unit 2.

The southern border of Area 1 is contiguous to the waste mass of Bridgeton Landfill, a quarry-fill landfill containing municipal waste. At the present time, Bridgeton Landfill is experiencing a Subsurface Smoldering Event (SSE) in its South Quarry Area. While the SSE is currently a significant distance from OU-1 Area 1, Bridgeton Landfill wishes to develop a response strategy to ensure that the SSE does not spread into the Area 1 RIM. One contingency under consideration is a subsurface thermal barrier located between Bridgeton Landfill's waste mass and the RIM located within West Lake OU-1 Area 1.

1.2 PROPOSED ISOLATION BARRIER

Bridgeton Landfill has evaluated the possibility of an excavated isolation barrier as a contingency means to prevent the SSE from advancing into the radiologically impacted material in West Lake OU-1 Area 1. Specifically, Bridgeton Landfill evaluated the excavation of waste to create an isolation barrier south of the southern limit of radiologically impacted material. Such an approach would also limit the volume of waste excavation, consistent with concerns raised by

the Lambert-St. Louis International Airport Authority. Finally the relative speed of construction, about three months, allows such a system to be implemented quickly. This isolation barrier would provide the physical barrier that Missouri Department of Natural Resources (MDNR) has requested.

In order to develop the design plans for the isolation barrier, additional subsurface data is needed between known extent of the Radiological Impacted Material (RIM) within West Lake OU-1 Area 1 and the Bridgeton Landfill - North Quarry Area. This work plan proposes advancing several Cone Penetration Tests (CPTs) to determine the characteristics of the subsurface materials within proposed alignments of the isolation barrier and in between the potential barrier alignments and the southern edge of the Area 1 fence. The CPT device proposed within the work plan will also be capable of measuring gamma counts which will provide a fairly high degree of certainty that the proposed isolation barrier can be constructed without encountering RIM.

Consistent with discussions with the Missouri Department of Natural Resources, this Gamma Cone Penetration Test (GCPT) investigation will be the first of two phased investigations to confirm the thermal barrier location. An additional Work Plan and Health and Safety Plan for a boring / coring technology will be submitted which will detail the locations and procedures of borings, core sample collection, and sampling for the eight radioisotopes, as well as other potential hazardous constituents of concern within the barrier alignment proposed following completion of the GCPT. However, the second phase of this investigation is outside the scope of this GCPT Work Plan and GCPT Health and Safety Plan

1.3 GOALS OF THE INVESTIGATION

Therefore, the primary goals of this investigation are:

- Determine the stratigraphy, nature, and geotechnical properties of subsurface materials for design purposes,
- Determine liquid levels,
- Determine if RIM exists within the proposed alignments, and
- Determine depth to native material.

Therefore, the primary goals of the Phase 2 investigation will be:

- Obtain core samples for analytical testing, and
- Determine type of waste/subsurface material (i.e. rock, municipal solid waste, construction and demolition waste, etc.)

2 PREVIOUS INVESTIGATIONS

Previous investigations in the vicinity of the contingent thermal barrier did not contemplate construction of a physical structure; therefore, high-density geotechnical data does not exist. However, previous investigations have evaluated presence of radioactive materials at West Lake Landfill using downhole gamma radiation logging of soil borings, collection and analysis of surface and subsurface soil samples, and overland gamma surveys.

2.1 PRIOR INVESTIGATION METHODS

Downhole gamma radiation logging and overland gamma surveys were used as the primary detection methods for these investigations. In addition, soil samples were collected for analysis of uranium, radium, thorium isotopes and their decay products as well as for non-radiological constituents. Results of these investigations are presented in the Soil Boring/Surface Sample Investigation Report (McLaren/Hart, 1996) and the OU-1 Remedial Investigation Report (EMSI, 2000). Eight radionuclides were identified as contaminants of concern based on their long half-lives: U238, U234, Th230, Ra226 and Pb210 from the U238 series; U235 and Pa231 from the U235 series, as well as Th232. Isotopes from the Thorium-232 decay series are also present at levels above background, although to a lesser extent.

2.2 EXTENT OF AREA 1 CONTAMINATION

Downhole gamma logging by McLaren/Hart in Area 1 found elevated radiation levels varying from zero to sixteen feet below ground surface (bgs), while the thickness of the materials generally ranged from one to five feet in Area 1. In the northwest region of Area 1, elevated readings ranged from zero to six feet bgs, while to the southeast, elevated readings were found as deep as 15 feet bgs. The impacted area is illustrated in Figure 2.

An overland gamma survey also detected gamma radiation above background at the ground surface. Results of the overland gamma survey are also shown in Figure 2. Laboratory analyses of surface soil samples (the upper 6 inches) detected radionuclides at levels above 5 pCi/g above background at boring locations WL-106 and WL-114.

2.3 SFS ESTIMATE OF RIM BOUNDARY

The 2011 Supplemental Feasibility Study (SFS) included a detailed estimate of the extent of RIM. An outline of the known impacted material was created using the available boring data, as well as an outline of the known non-impacted area (see SFS Appendix B-1, Figures 3 and 4). Based on these boundary conditions, the estimated border of the RIM was interpolated between these two boundaries. These boundaries, the interpolated RIM limits, and borings used to estimate the limits are shown in Figure 2 of this Work Plan.

The SFS delineation of the extent of RIM was sufficient for purposes of developing and evaluating potential remedial alternatives for OU-1. However, construction of the proposed thermal barrier

requires a high degree of confidence that the alignment for proposed thermal barrier is located outside of the extent of RIM. Therefore, as part of geotechnical investigation of the proposed alignment, data will also be obtained to confirm that the selected alignment is not located in areas where RIM is present.

3 PROPOSED INVESTIGATION

3.1 OVERVIEW OF TECHNIQUE

The goals of the investigation are to gather the required geotechnical data for design and to provide confirmatory observations that material within the proposed excavation area and in between the potential barrier alignments and the southern edge of the Area 1 fence do not contain radiologically impacted material above the level appropriate for unrestricted use. The approximate limits of the materials containing materials higher than the standard for unrestricted use (5 pCi/g above background) were delineated in the 2011 Supplemental Feasibility Study. The general approach is to increase the number of observations in situ to verify that the selected alignment for the thermal barrier is located outside of areas of RIM. In addition, information is to be collected at each location regarding the stratigraphy, nature, and geotechnical properties of the materials as well as liquid levels, as relates to the design of the barrier system. Cone penetration with piezometer pressure readings (Piezo-Cone or CPT) along with a gamma radiation (G) sensor in a tool string has been selected as the most effective means of obtaining all the desired information within the area of interest.

The GCPT technique does not generate waste or bring physical material to the surface, does not generate dust or airborne emissions, and does not require introduction or collection of water or liquids (other than decontamination procedures). Therefore, it is a very suitable method for investigating areas that have the potential to contain radiological materials above background and landfill refuse.

Conceptual evaluation of barrier designs, reported in the March 29, 2013, letter to Mrs. Fitch of MDNR from Craig Almanza, identified potential alignments along which the barrier could be constructed. The conceptual evaluation also identified that the amount of material requiring excavation and the depth of such a barrier would be substantially lessened – along with all the negative impacts associated with waste excavation – if the barrier alignment were moved toward the north. This would allow avoiding the existing slopes of the North Quarry fill and would reduce the depth of excavation along the eastern portion of the alignment, where quarry activity followed by landfilling would require a much deeper excavation the farther south the barrier is located. The proposed investigation allows collection of information south of and, in some locations, up to the projected line of RIM material, in order to confirm the absence of RIM in the selected location and in between the potential barrier alignments and the southern edge of the Area 1 fence.

3.2 GAMMA CONE PENETRATION TESTING (GCPT)

GCPT (Piezo-Cone) soundings are a standard means of subsurface investigation and have been in widespread use since the 1980's. The general methodology and equipment used is described in ASTM D5778 and consists of an instrumented conical tip and friction sleeve of approximately

37.5 mm in diameter, fitted on the lower end of push rods that are forced at a constant rate into the subgrade. An electrical pressure transducer is included in the interval between the conical tip and the friction sleeve. A typical cone assembly is shown in Appendix A.

Tip force, sleeve force and pressure are all recorded as the push rods are advanced. Reading intervals are taken at intervals not exceeding 50 mm. The advance rate of the probe is approximately 2 cm/second, which is the ASTM Standard.

The type of soils, including waste materials, is inferred based on the analysis of combination of tip, sleeve and pore pressure while advancing (referred to as dynamic pore pressure). Work at other sites has demonstrated that interfaces between waste material and natural soil can be identified.

While the dynamic pore pressure is useful in the determination of soil types, static pore pressures can also be measured by performance of pore pressure equalization tests. This will provide the necessary information to determine liquid levels in the potential excavation area. These are performed by temporarily halting the progress of the cone and monitoring the pore pressure change with time. Given the typically sandy nature of the natural overburden it is anticipated that such tests will be of limited duration prior to attaining near steady state readings.

The gamma radiation logging will be performed using a proprietary device that is included in the equipment tool string behind the GCPT head. The device uses Cesium Iodide crystals. The device differs from a typical downhole logging gamma detector in that it is part of the push rod system and therefore has greater shielding from the thicker rod walls and is smaller in diameter for the same reason. However the device has been used successfully on other projects to detect the differences between clays and silts. A site specific empirical relationship will be developed using previously logged holes, as described in Section 3.2.1.2.

As stated previously, the purpose of the GCPT investigation is to identify subsurface radioactive material that may be present. The process is qualitative in nature and is not intended to be quantitative. Once the initial data is collected from the GCPT investigation (Phase 1) and a proposed location for the thermal barrier is determined, soil samples will be taken to perform a more complete analysis (Phase 2).

The soil core samples will be collected using sonic drilling, GeoProbe drilling, or other available and appropriate technologies. The samples will be collected using Auxier Procedure 3.3. The soil samples will be taken at various depth locations of the core boring sample. Biased samples will be taken at locations of radioactivity as identified by field radiation detection instruments. Other samples will also be taken where no radiation is detected by such radiation detection instruments. This procedure will be detailed in the Phase 2 Investigation Work Plan.

3.2.1 CPT Techniques

3.2.1.1 Cone Rig

A track mounted rig is proposed for the project. The rig will be able to supply 25 to 30 tons of down pressure. The track mounted rig exerts a limited ground pressure (less than 4 psi) and does not require hold-down anchors. This should avoid breaking the ground surface other than at the probe hole. The rig is self-contained, with all equipment readout, recording and on-board electricity within the equipment cab.

3.2.1.2 GCPT Correlation

3.2.1.2.1 CPT Device (Lithology Correlation)

These units will be correlated and tested in accordance with ASTM D5778. Correlation to in situ conditions for verification of the various zonation algorithms that may be applied will occur at soundings proximate to WL-108, WL-111, and WL-119 as well as at the gamma sensor calibration holes, as described below. The GCPT device correlation will only be between waste and in-situ alluvium.

3.2.1.2.2 Gamma Sensor (Radiological Impacted Material Correlation)

The gamma sensor readings will be correlated to site conditions in two ways. Soundings near the locations listed above, which are well outside the estimated RIM limits, will be used to establish a range of counts that are typical of background. This initial background value will be used to determine what readings obtained in the sounding locations trigger decontamination procedures. The value may be modified as the work progresses in non-RIM soundings.

In addition, soundings will be performed at the PVC-38 location, where previous gamma logging measured levels above background. The resulting readings will be used to evaluate a relationship between previous counts and the GCPT unit. If the original casing can be found, attempts will be made to advance the GCPT head within the existing casing. Otherwise two soundings will be performed, located at a 2-foot offset from the hole to the north or south, and will be advanced to a depth of 20 feet.

The use of boring hole PVC-38 is to correlate the readings obtained by the GCPT device in a boring known to have increased levels of radiation. This procedure will ensure that the device is operating as expected as the sensitivity to radiation is confirmed. As recommended by the USEPA in General Issue comment number 2, the correlation will also include a boring location of low or intermediate gamma readings to further define the relative sensitivity of the GCPT device. Boring hole PVC-28 will be used as an additional correlation site.

A daily response check of the GCPT will be performed with a check source such as a container of potassium carbonate (K_2CO_3) (which contains the naturally occurring isotope potassium 40) or a button source. This response check will be performed at the beginning and end of each day.

The sensor correlation readings will be taken prior to performance of the other soundings.

3.3 INVESTIGATION PROCEDURES

3.3.1 Land Clearing

As depicted on Figure 3, there will be 68 GCPT locations, with the 10 additional sampling locations extending to the southern perimeter fence line, in addition to GCPT calibration locations. The existing conditions of Area 1 include woody overgrowth and trees. Paths will be developed to minimize the clearing, but to allow access to all the GCPT locations. The vegetation will be cleared by selective woody vegetation removal techniques which allow small track mounted machines to cut and grind the vegetation in place. This should also minimize soil disturbance.

The path for the GCPT test locations will be determined by connecting nearby clearing paths which will originate from a cleared baseline (approximately following the N-1 Alignment). Paths connecting consecutive GCPT locations will start from this baseline, as depicted in Figure 3.

The paths will be guided by an onsite surveyor, and an onsite health physicist who will conduct an overland gamma scan. A Ludlum 2221 ratemeter/scaler mated to a Ludlum 44-20 3x3" NaI detector will be used to survey selected portions of ground surface within and around Area 1. This instrument will be coupled to a Trimble GPS and operated in the ratemeter mode. This mode will allow the gamma count rate from the instrument to be collected at one-second intervals and assigned to its specific measurement location (latitude and longitude).

The operator will hold the detector approximately 30 cm above the ground surface and advance across the areas of interest in a series of straight lines at a rate of approximately one meter per second. The separation distance between the lines will be approximately 1.5 meters. After the survey, the field data will be processed using a combination of industry-standard commercial computer applications. Because all data points will be tied to a spatial coordinate, a map of the data will identify areas of surface soil containing RIM. These areas can then be located in the field and avoided or covered.

If the overland gamma scan indicates a radiological level over background, the health physicist will notify the clearing crew that they could be in an area that has surface RIM, and to proceed in a manner that avoids ground disturbance. The path will be cleared of vegetation 10-20 feet in the general direction dictated by the onsite surveyor, then the cleared path and the path to be cleared (as much as practicable) will be scanned with the overland gamma scan, then the next section will be cleared. This procedure will be used in the same sequence until the desired test location has been reached. It is envisioned that paths to each test location will be approximately 10-15 feet wide, while a larger area (25-30 feet diameter) will be cleared at each test location.

The brush clearing will be accomplished by using a skid steer rotary brush and tree cutter. This device is an attachment to a track mounted skid steer tractor in the front of the machine, so the cutting and grinding platform will advance before the tractor and operator. The operator will place the cutting surface a few inches above the ground surface, and the ground wood chips will be coarsely ground and left in place. This should provide an adequate surface for the geotextile.

Small trees a few inches in trunk diameter will be shred in place. If larger tree diameters are encountered, an attempt will be made to alter the path around the tree. If it is impossible to avoid the large diameter tree, then a logger will be tasked to cut the tree at the surface. The tree will then be pushed to the side of the alignment by the skid steer and left in place.

Attempts will be made to minimize grinding of vegetation as much as possible. If appropriate and indicated, vegetation may be wetted before grinding. It is the goal to minimize any airborne particles generated by the vegetation clearing process. Extra effort shall be given to find suitable paths that do not require grubbing, and the use handheld equipment to clear/prune vegetation will be used where practicable.

3.3.2 Near-Surface Preparation

Once the path is cleared, a crew will deploy a minimum 6 ounce per square yard non-woven geotextile, and then approximately 6-8 inches of rock aggregate will be spread to advance gravel roads to each test location along the cleared alignments. This should greatly reduce the risk that soil contamination may be transmitted to the field crew, and minimize any rutting due to ingress and egress.

The area of investigation is known to contain small surficial layers of concrete and other inert rubble which in some locations may extend below the ground surface several feet. If necessary, a small trackhoe will be used to push rubble aside and, if necessary, remove near surface material below grade. Such an excavation, if required, will be kept to minimum practical dimensions and the resulting void will be backfilled with clean soil material which is tracked or pounded in place to create a stable surface for the geotextile and gravel pad described above. The rubble that is removed to the side of the CPT investigation area will be radiologically screened as described in Appendix C and allowed to remain in place if screening is negative.

Any removal of any surficial concrete or other rubble will be kept to an absolute minimum. Attempts will be made to disturb the soil as little as possible, if at all. A radiation survey will be performed of any such materials moved and records will be maintained.

3.3.3 Surveying

Once the final location for the GCPT has been cleared and the gravel access corridor has been constructed, the surveyor will affix a stake at the proposed location. The stake will be marked with a high visibility flag and the GCPT number, the Northing, Easting, and final ground surface elevation will be documented with permanent marker onto the stake. This information will also be recorded by the surveyor onto his/her field book or data logger.

3.3.4 GCPT Logging

Once the locations have been staked and checked, the GCPT rig will be deployed. It is envisioned that the GCPT rig will proceed to the first location, WL-111. This was a previously logged boring from the 1996 McLaren/Hart field investigation that included both lithology and downhole gamma logging. The rig operator will check the location and elevation information that is marked

on the survey lathe to the information within the operator's notes. If there is any deviation, the operator will notify the Project Manager, who will determine if additional surveying is needed. If there is no conflict in the data, the GCPT rig operator will conduct the GCPT and log the data. The GCPT operator and the Project Manager will then determine if the gamma logging confirmed the absence of RIM material, consistent with the 1996 gamma log. In addition, the Project Manager will compare lithology from the new GCPT log and the 1996 McLaren/Hart boring for general consistency.

Please note that it is expected that WL-111 will contain no RIM due to the 1996 McLaren/Hart information.

This same procedure will be repeated at the WL-108 and WL-119 boring locations for consistency review with the previous work.

The GCPT rig will then be deployed to PVC-38 and PVC-28, where RIM is expected to be found. After the GCPT log is obtained from this location, the data will be downloaded and analyzed to determine if the GCPT was able to detect elevated gamma counts as the 1996 McLaren/Hart gamma log did, as shown on the original NGamma log included in Appendix B. The GCPT operator will then move the rig to the decontamination area for proper decontamination and radiological survey in accordance with this Work Plan. Based on the data collected, the Project Manager will determine whether readings at additional locations are needed.

Once it has been determined that the procedure is adequate for the determination of RIM and non-RIM materials, the GCPT rig will advance to each of the GCPT boring locations. After each GCPT test, the rig will be scanned and decontaminated before proceeding to the next test location. Each sounding hole will be filled with bentonite-coated pea gravel from the surface.

3.4 Contamination Surveys and Decontamination Procedures

The potential to spread contamination will be mitigated by checking equipment and personnel as they leave Permitted Areas. If contamination is identified, the contamination will be removed and the equipment rechecked. This is an iterative process that will continue until equipment and personnel meet exit criteria.

3.4.1 Radiological Surveys

Surveys will be used to monitor and control exposures and the potential spread of contamination. The following subsections describe the surveys to be used and their requirements.

3.4.1.1 Baseline Entry Survey – Equipment

All vehicles and large equipment entering Area 1 will be surveyed by the RCT (Radiation Control Technician) for fixed alpha and beta contamination before its initial entrance into Area 1. The survey will be conducted using a Ludlum Model 12 coupled to a Model 43-5 (or equivalent), and a Ludlum Model 12 coupled to a Model 44-9 (or equivalent) as described in A&A Procedure 2.7.

3.4.1.2 Permitted Area Exit Survey - Personnel

Personnel exiting a Permitted Area will have their shoes and clothing scanned upon leaving the area, as described in A&A Procedure 2.7. Records will include the name of the individual, the results of the exit survey, the location, and the times they entered and left the area on the a standard form such as A&A Form 11, Personnel Monitoring Form or a log sheet attached to a copy of the Radiation Work Permit. A reading of two (2) times the ambient background level will require decontamination before leaving the area.

3.4.1.3 Permitted Area Exit Survey - Equipment

Heavy equipment working inside a Permitted Area will be surveyed by the RCT before leaving the area. All surfaces in contact with soil will be scanned for beta surface activity with a Ludlum Model 12 coupled to a Model 44-9 (or equivalent) as described in A&A Procedure 2.7. A reading of two (2) times the ambient background level will require the equipment be decontaminated and resurveyed before it leaves the Permitted Area.

Sections of the downhole probe body will be sampled with a swipe between sampling locations detect any removable activity on the surface of the tool string. The swipe samples will be screened in the field with a Ludlum Model 12 coupled to a Model 43-5 alpha detector. A final measurement of alpha and beta activity on the smear will be performed using a Ludlum 2929 coupled to a Ludlum 43-10-1 or a low-background alpha/beta counter such as a XLB-5.

3.4.1.4 Final Release Survey - Equipment

Equipment working inside a Permitted Area and equipment that might inadvertently contact contaminated soil outside a cleared easement will be surveyed by the RCT before leaving Area 1. All surfaces in contact with soil will be scanned for alpha and beta contamination with a Ludlum Model 12 coupled to a Model 44-9 (or equivalent), and a Ludlum Model 12 coupled to a Model 44-5 (or equivalent) as described in A&A Procedure 2.7.

Removable contamination will be sampled by swiping 100 cm^2 areas on parts of the equipment that were in contact with soil surfaces as described in Procedure 3.6. These smear samples will be counted with a Ludlum Model 29 coupled to a Ludlum 2929 coupled to a 43-10-1.

If contamination is found, the vehicle will be decontaminated until it meets final release standards listed in Table 2. The equipment identification and the final results will be recorded on the appropriate equipment release form from the A&A Procedures Manual and the equipment will be unconditionally released from Area 1.

Table 2 Final Release Survey Limits for Equipment

Parameter	Limit	Meter Reading [a]
Fixed Alpha	100 dpm/100cm^2, average	20 cpm Mo 12/Mo 43-5
(Ra-226 & Th-230)	300 dpm/100cm^2, maximum	60 cpm Mo 12/Mo 43-5
Fixed Beta	5,000 dpm/100cm^2, average	750 cpm Mo 12/Mo 44-9
(U_{nat} & assoc. decay products)	15,000 dpm/100cm^2, maximum	2250 cpm Mo 12/Mo 44-9
Removable Alpha	20 dpm/100cm^2, average	na
Removable Beta	1,000 dpm/100cm^2, average	na

[a] Nominal values. Meter efficiencies will be reevaluated at the site.

3.4.2 Equipment Decontamination

All equipment (including but not limited to the GCPT rig) will be surveyed in accordance with Section 3.4.1 of the Work Plan. If radioactive contamination is detected, the equipment will be decontaminated. A phased approach to decontamination will be employed to minimize the generation of solid waste and waste water.

3.4.2.1 Dry Decontamination

It is expected that any contamination will be associated with loose, removable dirt and mud that may attach to the equipment's surfaces during operations. If contamination is detected on equipment after operations are completed in a Permitted Area, an attempt will be made to decontaminate the equipment before moving to the next Permitted Area. Visual patches of dirt and mud will be removed from the contaminated surfaces of the equipment using damp wipes, brushes, and scrapers. Used decontamination supplies will be placed in marked containers or bags. Chunks of removed mud and dirt will be placed down the closest sounding holes to the extent practical. The remainder of material removed during dry decontamination will be placed in a separate container with hard plastic or metal sides and staged for retrieval and sampling. The equipment will be resurveyed and allowed to leave the next Permitted Area if it meets the requirements described in Section 3.4.1.3.

3.4.2.2 GCPT Rig Decontamination

The CPT rig is equipped with a rod cleaning system. Tool strings (push rod probes) will be washed/wiped as they are removed from the ground to remove visible dirt and mud.

The washing system passes the rods, upon extraction, through a chamber with a wiper at the top and bottom. Heated wash water can be introduced as needed into the chamber to clean the rods more thoroughly. Upon completion of the soundings the washing chamber will be washed with Alconox and triple rinsed, and the wipers will be replaced. The wash water generated by these operations will be piped to the exterior of the rig, where it will be then collected outside the CPT rig and retained in a portable tank.

3.4.2.3 Wet Decontamination of Equipment

If dry decontamination is not sufficient to meet release levels, the equipment will be moved to the radiological decontamination pad. Contaminated surfaces will be scrubbed with brushes and soapy water until they are visually clean. The equipment will be surveyed again for both alpha and beta surface activity. If fixed or removable activity exceeding the release limits is found, the contaminated surface will be decontaminated using more aggressive methods such as pressure washing or abrasive blasting until the release criteria are met.

3.4.2.4 Waste/Water Management

Water used to decontaminate equipment will be placed in marked holding tanks and/or drums, sampled, and packaged and shipped to a licensed, managed disposal site.

Any solid radioactive waste generated will be packaged and characterized for shipping. This material will be shipped to managed disposal/treatment facilities that are permitted to receive the waste.

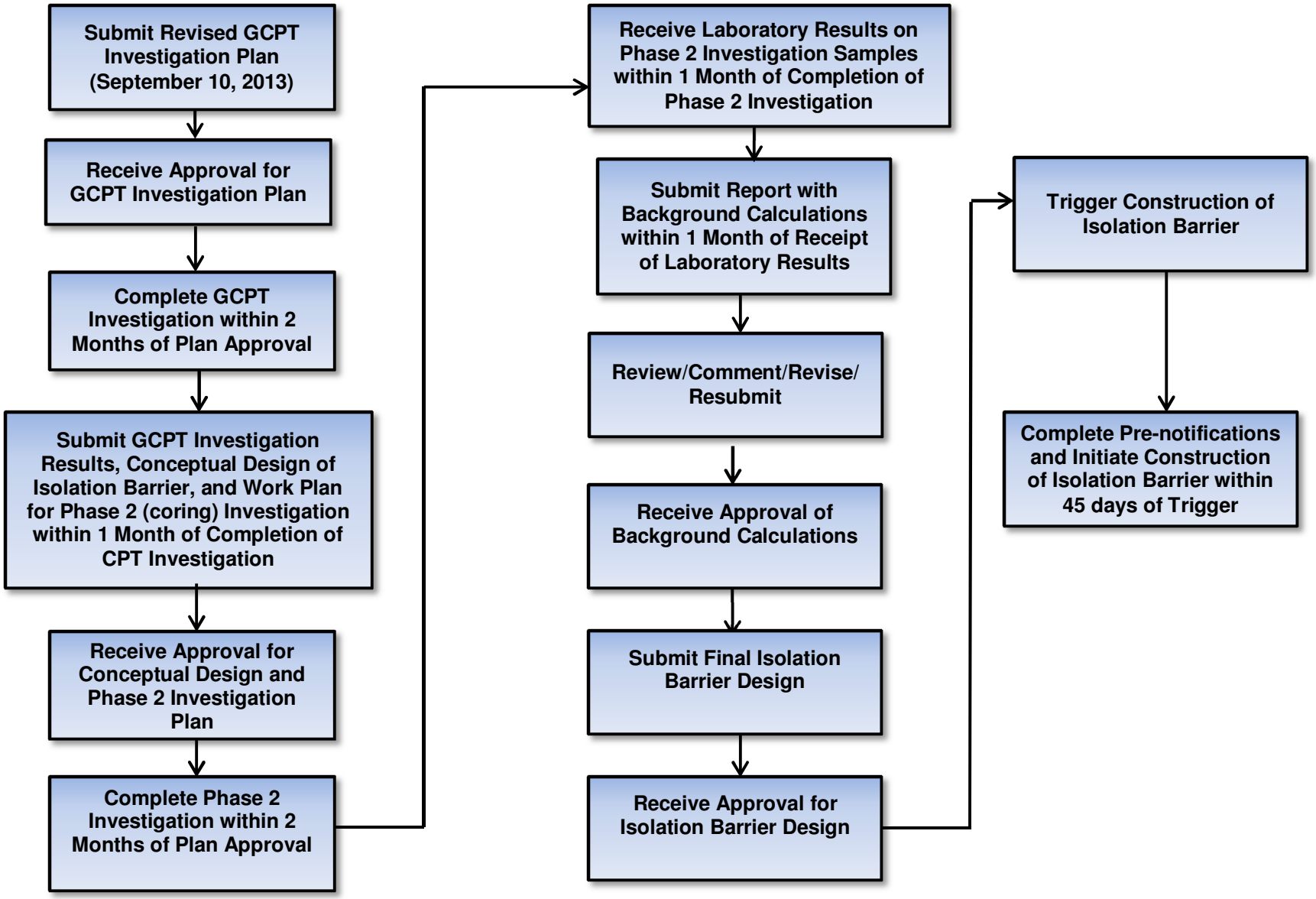
3.4.2.5 Final Housekeeping Wash-down

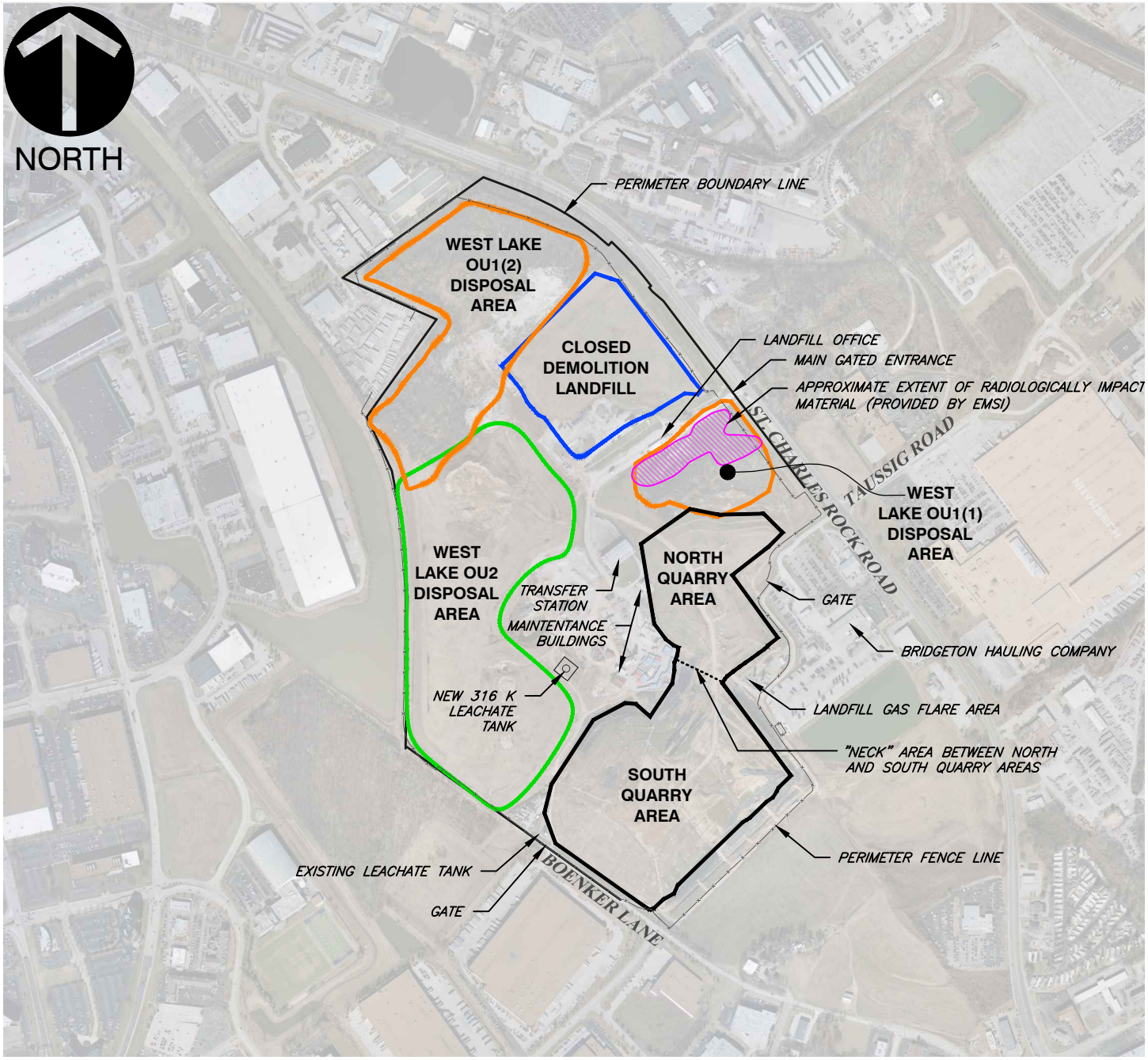
Because of the very high visibility of this sampling event, any equipment released from Area 1 will be washed with soap and water to remove visible dirt from its surfaces prior to its removal from the project. This final housekeeping can be performed in an uncontrolled area and any water generated from this final cleaning of previously released equipment will be considered unimpacted.

3.4.3 Decontamination Pads

Two separate decontamination pads will be constructed directly from the gravel clearing pads. A radiological decontamination pad will be constructed near PVC-38. This pad will be used to decontaminate equipment failing the free-release radiological requirements. A second pad will be provided for general cleaning of equipment that has not been exposed to RIM materials. This pad will be placed close to the fence near the entrance road to the OU-1 Area 1. These pads will be constructed using a geotextile and 8 inches of gravel.

TABLE 1
SCHEDULE FOR CONTINGENT ISOLATION BARRIER





REFERENCE

1. AERIAL IMAGERY PROVIDED BY EAST WEST GATEWAY COORDINATING COUNCIL OF MISSOURI AND ILLINOIS, COLLECTED IN LATE FEBRUARY AND EARLY MARCH OF 2012.
2. BOUNDARY INFORMATION PROVIDED BY SHERBUT–CARSON & ASSOCIATES, P.C. DRAWING NAME–1111 LEASE EXHIBIT.DWG RECEIVED ON 03/04/2013

SCALE IN FEET

0 1000 2000

BRIDGETON LANDFILL, LLC
13570 ST. CHARLES ROCK ROAD
BRIDGETON, MISSOURI

FACILITY MAP

DRAWN BY:	MSP	CHECKED BY:	MRB	APPROVED BY:	DRAFT	FIGURE NO.:	1
DATE:	JUN. 2013	DWG SCALE:	1"=1000'	PROJECT NO:	131-178.0001		

P:\2013\130-484\-CADD\Dwg\SolidWaste\131178-Figure_1.dwg[FACILITY MAP] LS:(6/27/2013 - ccolthorp) - LP: 6/27/2013 11:02 AM

LEGEND

	EXISTING GRADE (2' CONTOUR)
500	EXISTING GRADE (10' CONTOUR)
	ELEVATED DOWNHOLE GAMMA READING
	BOUNDARY OF ELEVATED DOWNHOLE READINGS
	NON-ELEVATED DOWNHOLE GAMMA READING
	BOUNDARY OF NON-ELEVATED DOWNHOLE READINGS
	INTERPOLATED RIM LIMITS
	OVERLAND GAMMA READING, BACKGROUND OR LESS
	OVERLAND GAMMA READING, 2X BACKGROUND OR LESS
	OVERLAND GAMMA READING, MORE THAN 2X BACKGROUND
	FENCE

WEST LAKE LANDFILL
13570 ST. CHARLES ROCK ROAD
BRIDGETON, MISSOURI 63044

WEST LAKE LANDFILL OU-1
AREA 1 RIM INVESTIGATION

PREVIOUS INVESTIGATIONS

Engineering for a Better World
FEEZOR ENGINEERING, INC.

DATE: JULY 2013
DESIGNED BY: DPE
APPROVED BY: DRF

REVISION	DATE

FIGURE
2

PROJECT NUMBER: BT-012 | FILE PATH: P:\Bridgeton Landfill\BT-012 (OU-1 A1 South RIM Determination)\Step 3 - Drawings\BT-012 GCPT INVESTIGATION.dwg

LEGEND

- EXISTING GRADE (2' CONTOUR)
- 500 EXISTING GRADE (10' CONTOUR)
- POTENTIAL BARRIER ALIGNMENT
- GCPT LOCATION
- CLEARING PATH
- ELEVATED DOWNHOLE GAMMA READING
- BOUNDARY OF ELEVATED DOWNHOLE READINGS
- NON-ELEVATED DOWNHOLE GAMMA READING
- BOUNDARY OF NON-ELEVATED DOWNHOLE READINGS
- INTERPOLATED RIM LIMITS
- FENCE

WEST LAKE LANDFILL 13570 ST. CHARLES ROCK ROAD BRIDGETON, MISSOURI 63044	WEST LAKE LANDFILL OU-1 AREA 1 RIM INVESTIGATION	Engineering for a Better World	DATE: JULY 2013 DESIGNED BY: DPE APPROVED BY: DRF	FIGURE
PROPOSED INVESTIGATION		FEEZOR ENGINEERING, INC.	1 9-6-13 PML	**3**
PROJECT NUMBER: BT-012	FILE PATH: P:\Bridgeton Landfill\BT-012 (OU-1 A1 South RIM Determination)\Step 4 - Drawings\BT-012 GCPT INVESTIGATION 2013-09-09 (renumbered From North).dwg		REV # DATE BY	

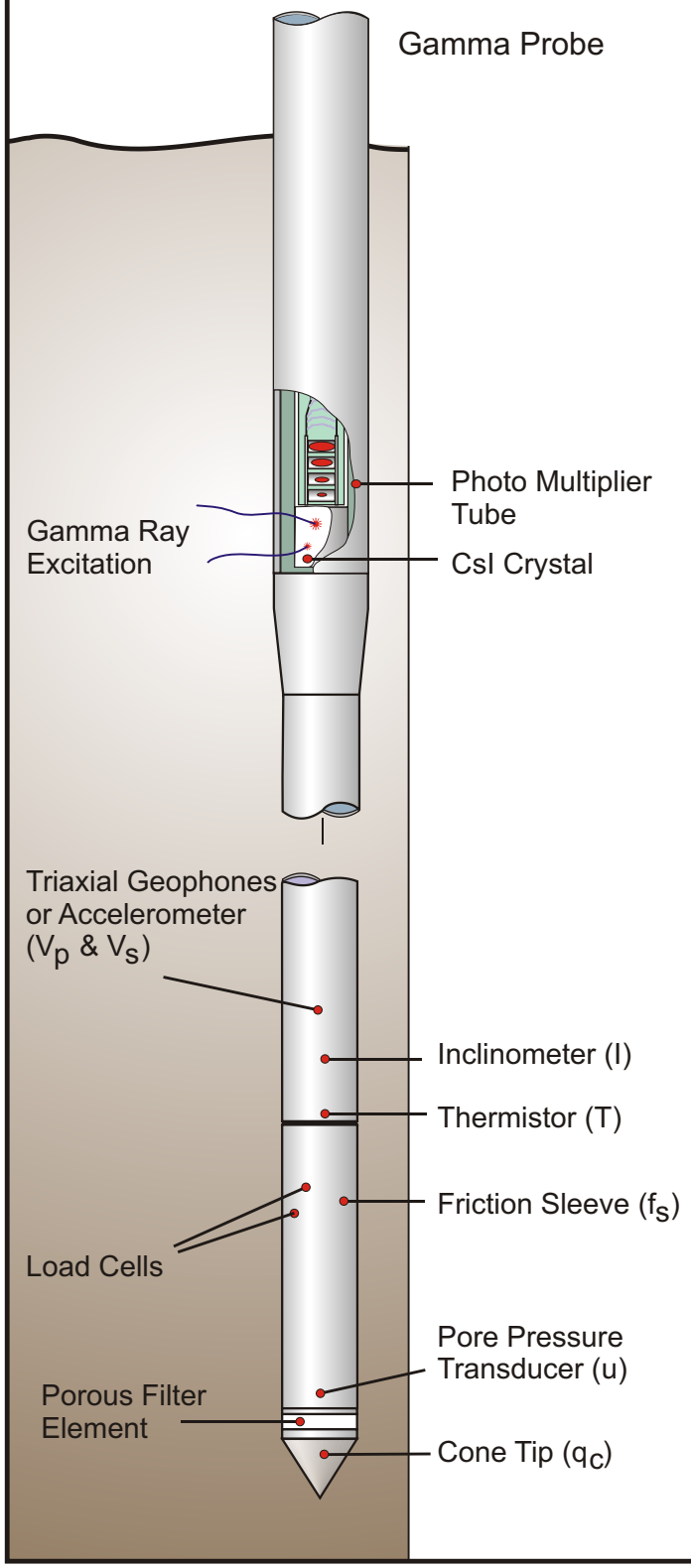
APPENDIX A

GAMMA CONE PENETRATION TEST (GCPT)
VENDOR INFORMATION

ConeTec

Geotechnical, Environmental and Marine Site Investigation Services

Gamma Cone Penetrometer (GCPT)



GCPT Description

The Gamma Cone Penetrometer (GCPT) can be used to better identify soil stratigraphy in conjunction with the CPT using natural gamma radiation which is present in all soil. Finer soils contain a greater amount of the radioactive elements; potassium, uranium and thorium. A continuous gamma ray profile can be logged and used to improve the CPT interpreted stratigraphy.

In addition, the GCPT has environmental applications. It can be used to locate radioactive contamination based on a gross gamma ray count. Once the contamination is located, the GCPT can develop a gamma energy spectrum in order to identify a contaminant. Since the GCPT is a penetration tool, there are no cuttings brought to the surface and worker exposure is minimized.


- CPT Trucks
- CPT Tracks
- Portable / Limited Access
- Heliportable CPT and Drilling Units
- Amphibious
- Drilling
- Marine

CPT Tracks

Features

- 25-30 Ton Thrust Capacity
- 4 Point Leveling Jacks
- Low Ground Pressure
- Stainless Steel Laboratory Interior
- Onboard Air & 110 v Electricity
- Built In Automatic Seismic Beam
- Positive Air Shut Off
- M2.5 Drill for CPT Drillouts

Services

- CPT Testing
- Seismic CPT Testing
- Push-in Electronic Piezometers & Dataloggers
- RCPT, UVIF-CPT, Gamma CPT
- Direct Push Soil & Water Sampling
- Direct Push Well Installations
- MIP(Membrane Interface probe) Testing
- Shallow Auger Drilling
- SDMT Testing

Advantages

- 30 ton Thrust Capacity
- Unprecedented Penetration Capabilities
- Clean, Dry & Warm Working Space
- No Anchoring Required
- Excellent Production Rates
- CPT Engineer & Technician Teams
- Environmental & Geotechnical Services
- 3.8 PSI Ground Pressure

Contact Us | Site Map | Project Enquiry Form

APPENDIX B

SOIL BORINGS AND DOWNHOLE GAMMA LOGS
WL-108, WL-111, WL-119

DOWNHOLE GAMMA LOGS PVC-28 AND 38

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
WL-108	07.0803035.003.002	1 of 1

Start/Finish Date	**Site Name and Location**
9/5/95	West Lake Landfill; Bridgeton, Missouri
Drilling Contractor	**Boring Location:** Area 1
Drilling Service Company	**Ground Surface Elevation:** 472.5
Driller	**Northing:** 1069144.21
Bruce Murphy	**Easting:** 516379.68

Drilling Equipment	**McLaren/Hart Geologist/Office**
LDH-30T Drill Rig, Large Diameter Auger	Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
24" OD Solid Auger	Grab from Auger	22'	None Installed

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	WL-108 5'	Background (0.02-0.04)	0.0-22.0' Landfill Debris: trashy debris consisting of wood, plastic, paper, rubber, metal, and cardboard; soil consisting of olive brown to dark gray silt, and rock; dry to wet.
10	None Taken	None Taken	
15	None Taken	None Taken	@ 12' wet
20	None Taken	None Taken	
25	None Taken	None Taken	Boring abandoned @ 22.0'

Notes:

Radiological sample collected at 5 feet below ground surface.
Non-radiological grab sample collected from perched water.
Perched water encountered at 12 feet below ground surface.
Groundwater not encountered during boring activities

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
WL-111	07.0803035.003.002	1 of 1

Start/Finish Date	**Site Name and Location**
9/11/95	West Lake Landfill; Bridgeton, Missouri
Drilling Contractor	**Boring Location:** Area 1
Drilling Service Company	**Ground Surface Elevation:** 474.5
Driller	**Northing:** 1069187.35
Bruce Murphy	**Easting:** 516583.61

Drilling Equipment	**McLaren/Hart Geologist/Office**
LDH-80T Drill Rig, Large Diameter Auger	Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
24" OD Solid Auger	Grab from Augers	52'	None Installed

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	WL-111 5'	Background (0.02-0.04)	0.0-50.0' Landfill Debris: trashy debris consisting of wood, plastic, cloth, brick, rubber, paper, wire, glass, and metal; soil consisting of olive brown to gray silt, dark gray to grayish brown silty clay, and crushed rock; dry to wet.
10	WL-111 10'	Background (0.02-0.04)	
15	WL-111 15'	Background (0.02-0.04)	
20	WL-111 20'	Background (0.02-0.04)	
25	WL-111 25'	Background (0.02-0.04)	
30	WL-111 30'	Background (0.02-0.04)	
35	WL-111 35'	Background (0.02-0.04)	
40	WL-111 40'	Background (0.02-0.04)	
45	WL-111 45'	Background (0.02-0.04)	@ 45' wet
50	WL-111 50'	Background (0.02-0.04)	
55	WL-111 51'	Background (0.02-0.04)	50.0-52.0' Native Alluvium: dark gray, silty, very fine-grained sand; wet. Boring terminated @ 52.0'.

Notes:

Radiological samples collected at 5 and 51 feet below ground surface.

Non-radiological samples not collected during boring activities.

Perched water not encountered during boring activities.

Groundwater encountered at 45 feet below ground surface.

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
WL-119	07.0803035.003.002	1 of 1

Start/Finish Date	Site Name and Location
9/29/95	West Lake Landfill; Bridgeton, Missouri

Drilling Contractor	Boring Location:	Area 1
Drilling Service Company	Ground Surface Elevation:	477.4
Driller	Northing:	1069031.14
Bruce Murphy	Easting:	516289.26

Drilling Equipment	McLaren/Hart Geologist/Office
LDH-80T Drill Rig, Large Diameter Auger	Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
24" OD Solid Auger	Grab from Augers	50'	None Installed

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	WL-119 5'	Background (0.01-0.04)	0.0-44.0' Landfill Debris: trashy debris consisting of yard waste, insulation, wire, wood, plastic, shingles, cloth, carpet, paper, glass, and metal; soil consisting of light brown to dark gray, silty, plastic clay to sandy silt; dry to moist.
10	None Taken	Background (0.01-0.04)	
15	WL-119 15'	Background (0.01-0.04)	
20	None Taken	Background (0.01-0.04)	
25	WL-119 25'	Background (0.01-0.04)	
30	None Taken	Background (0.01-0.04)	
35	None Taken	Background (0.01-0.04)	
40	None Taken	Background (0.01-0.04)	
45	WL-119 45'	Background (0.01-0.04)	44.0-50.0' Native Alluvium: dark gray, silty, fine to medium-grained sand; moist.
50	WL-119 50'	Background (0.01-0.04)	Boring terminated @ 50.0'

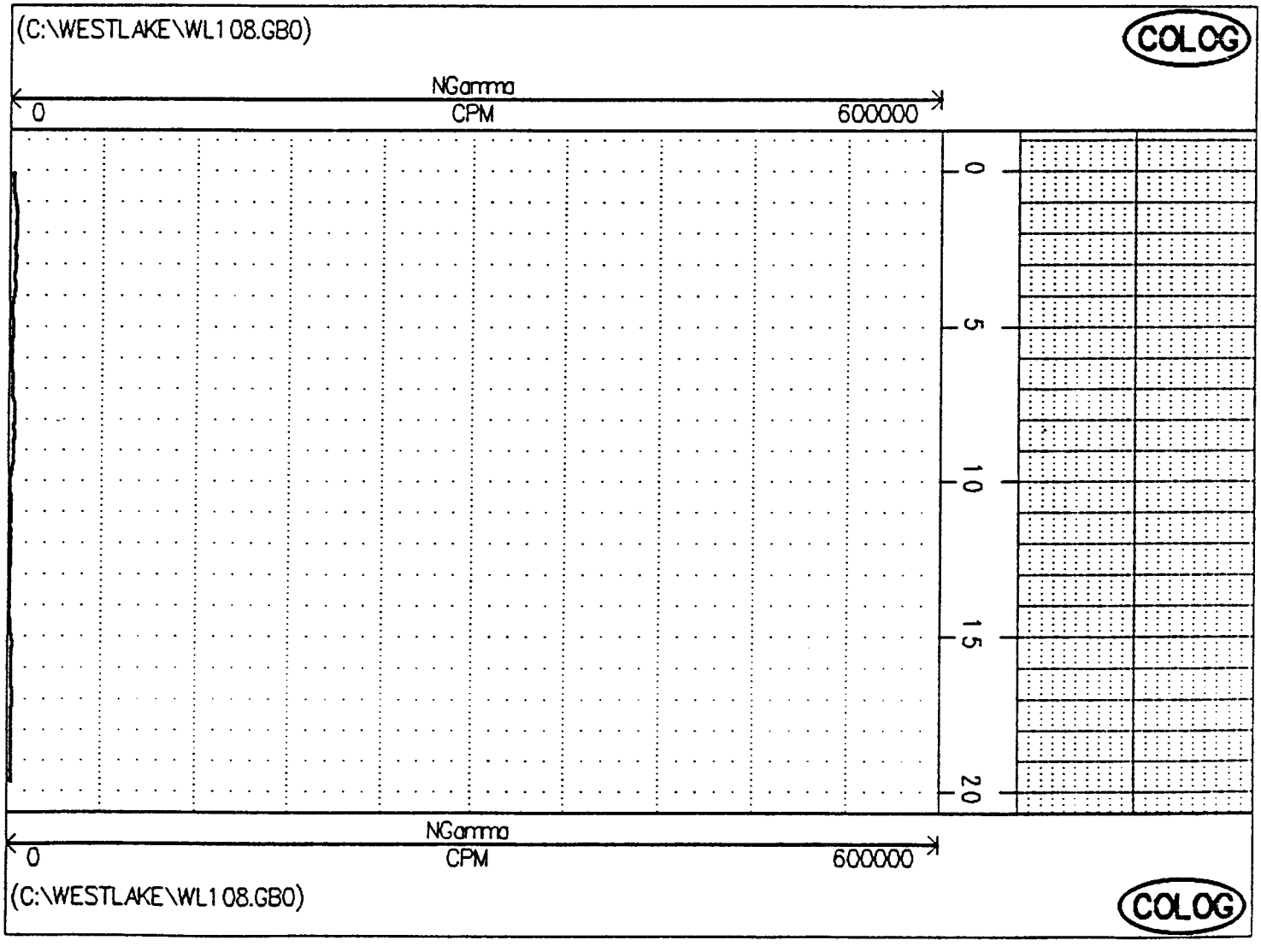
Notes:

Radiological samples collected at 5 and 50 feet below ground surface; duplicate collected and analyzed for 50' sample.

Non-radiological samples collected at 50 feet below ground surface; priority pollutant and priority pollutant duplicate sample collected and analyzed.

Perched water not encountered during boring activities.

Groundwater not encountered during boring activities.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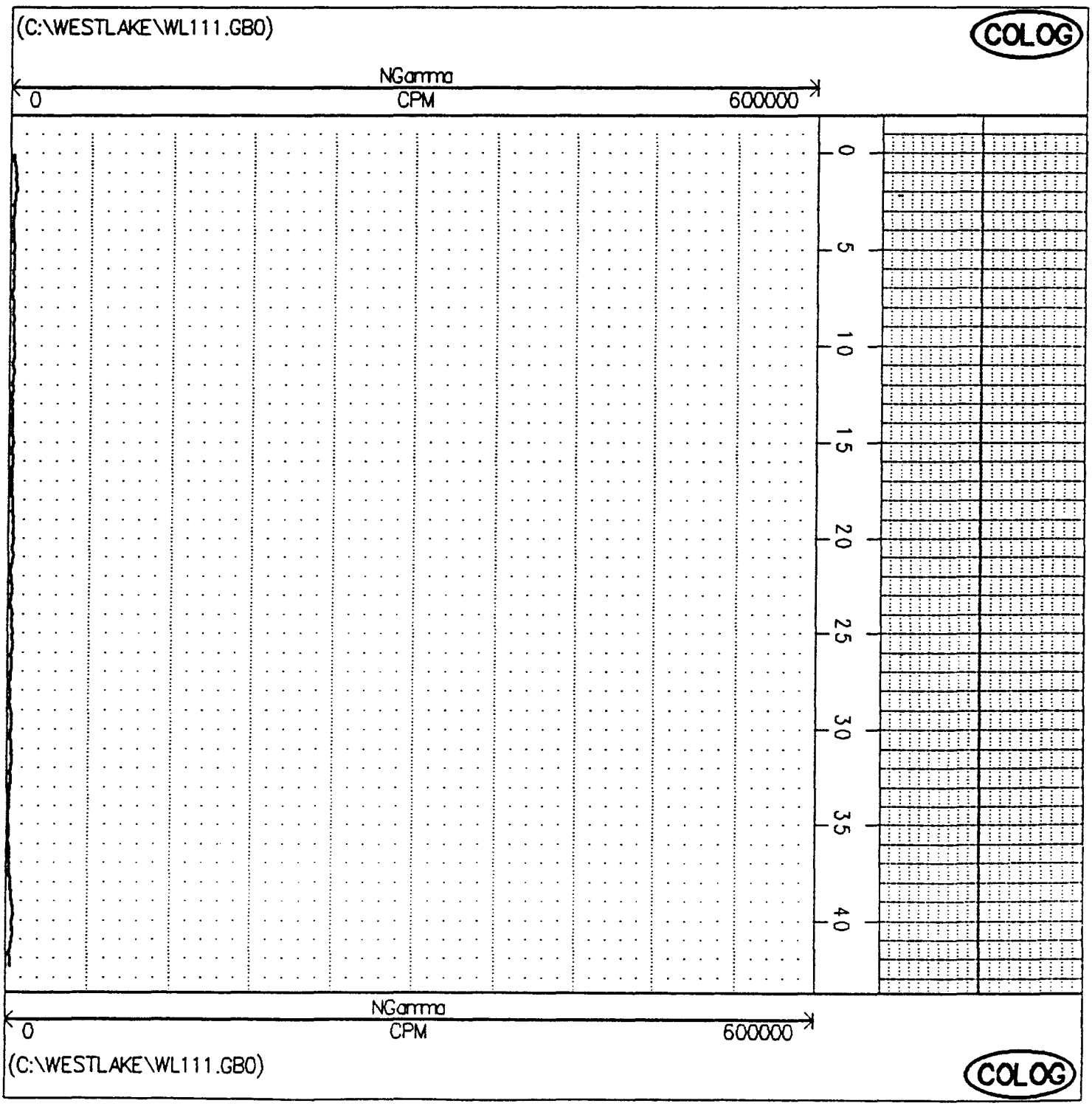
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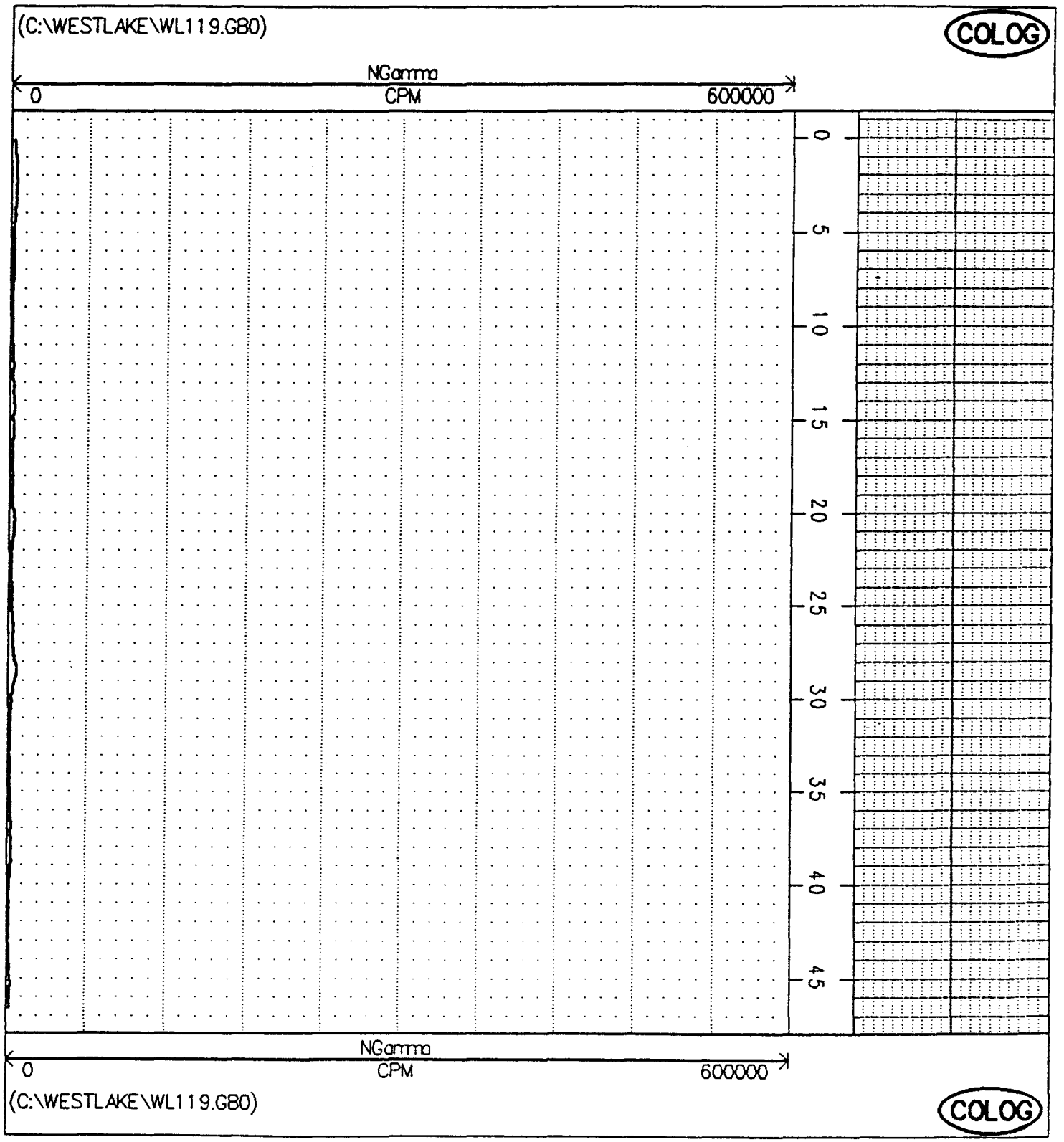
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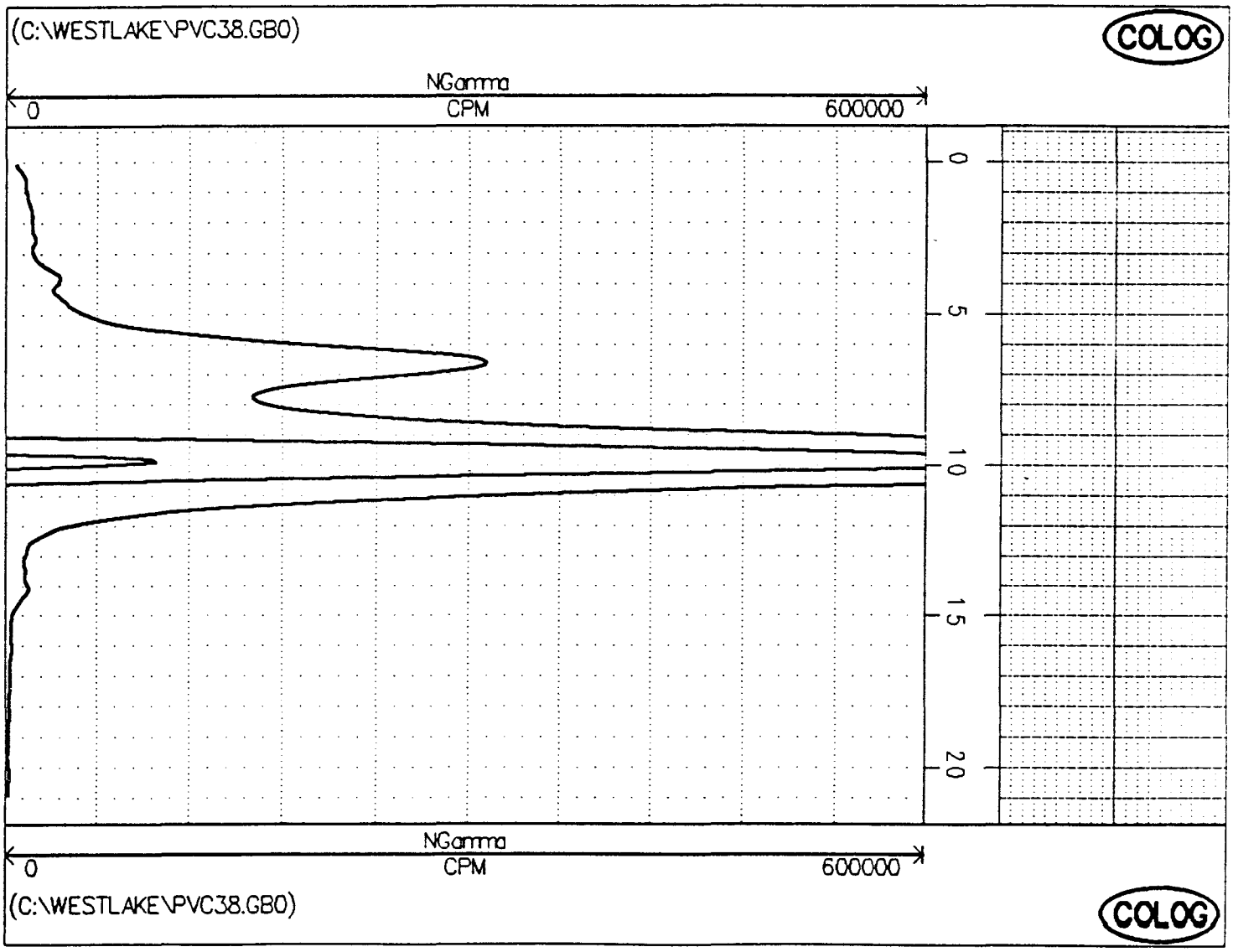
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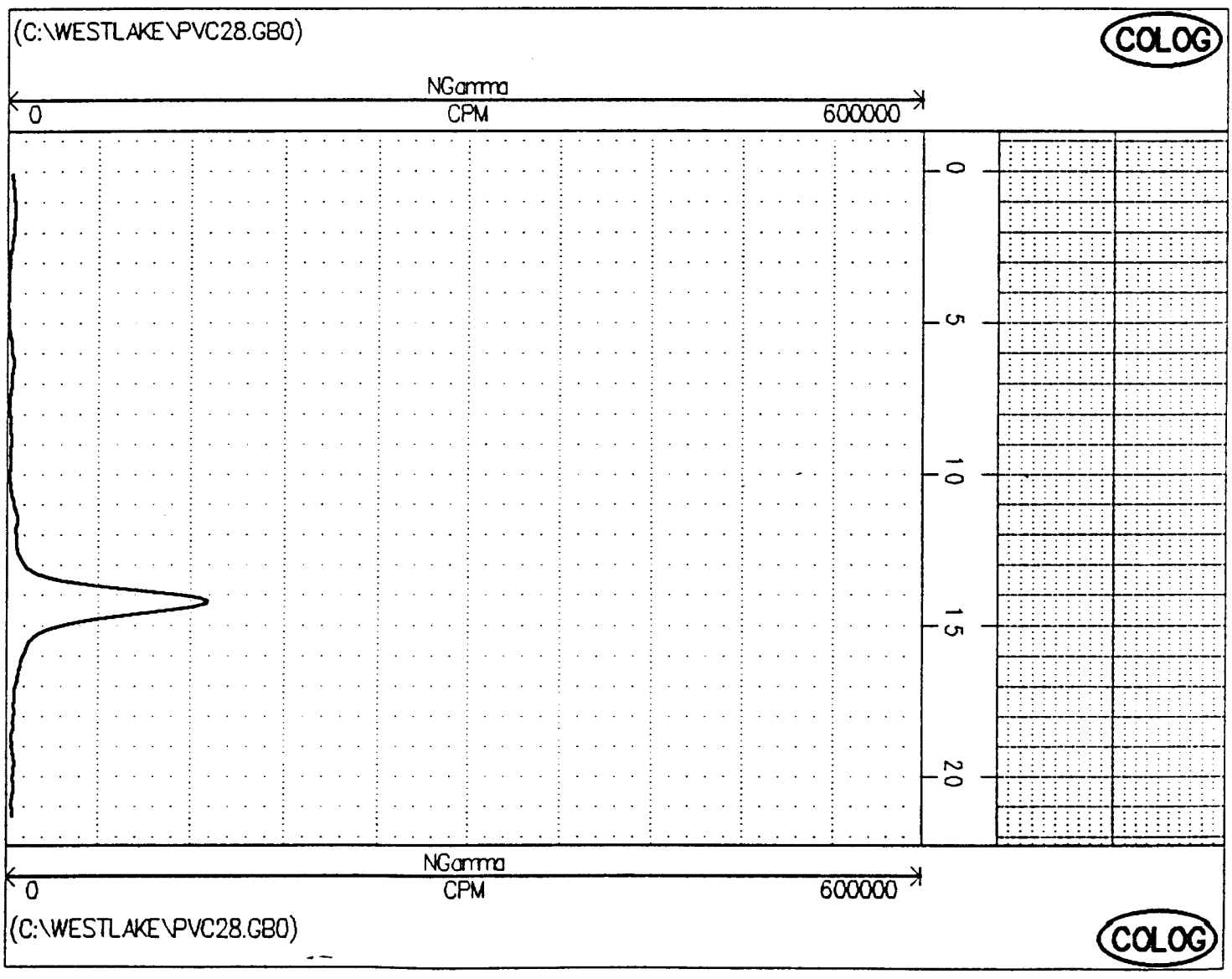
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APPENDIX C

RADIOLOGICAL FRISKING PROCEDURES

PROCEDURE 2.7
MONITORING PERSONNEL AND EQUIPMENT FOR RADIOACTIVE CONTAMINATION

1.0 PURPOSE

1.1 To describe the general approach for monitoring personnel and equipment for radioactive contamination.

2.0 RESPONSIBILITIES

2.1 The Site Survey Manager is responsible for assuring that this procedure is implemented.

2.2 Survey team members are responsible for following this procedure.

3.0 PROCEDURE

3.1 Upon exiting potentially contaminated areas, monitoring of clothing and exposed skin surfaces will be performed. Equipment and materials will also be monitored and shown to be free of contamination before release for use without radiological restrictions or controls.

3.2 Equipment

3.2.1 Ratemeter-scaler: Model 3 or Model 2221, Ludlum Measurements, Inc.; or equivalent, equipped with audible speaker or headphones.

3.2.2 Detector: Selected detectors are indicated below. Equivalent detectors are also acceptable.

Activity	Detector Type	Model
Alpha	ZnS scintillator	Ludlum 43-1 or 43-5, Eberline AC3-7 or AC3-8
	Gas proportional	Ludlum 43-68, Ludlum 239-1
Beta	Gas proportional	Ludlum 43-68, Ludlum 239-1
	Geiger-Mueller	Ludlum 44-9, Eberline HP-260

3.2.3 Instrument cables

3.2.4 Check sources

3.2.5 Record Forms and/or field logbook

3.3 Quality Control Check

Assemble instrument, turn on, check battery, and adjust high voltage and threshold, if necessary. Check background and source responses following Procedure 2.1.

3.4 Surface Scanning

3.4.1 Headphones or other audible signal operating modes are used for scanning.

3.4.2 Set the instrument response for "FAST", response where possible.

3.4.3 Pass the detector slowly over the surface. The detector should be kept as close to the surface as conditions allow. The speed of detector movement will vary depending upon the radionuclide of concern and the experience of the surveyor. While scanning for alpha or beta activity, the detector is typically moved about one detector width per second.

3.4.3 Note increases in count rate as indicated by the audible meter output. Identifiable increases in the audible response suggest possible contamination and should be resurveyed at a slower rate to confirm findings.

3.5 Personnel Monitoring

3.5.1 When monitoring for skin or clothing contamination, give particular attention to the hands, shoes, pant and shirt cuffs, knees, and other surfaces which have a high likelihood of contamination.

3.5.2 If there is detectable contamination, it should be removed as directed by the Health and Safety Committee (HSC) Chairperson. Decontamination guidance will be provided in the Survey Work Plan. The Site Safety Officer will implement decontamination or other contamination control actions at the project site.

3.6 Equipment Monitoring

3.6.1 For equipment surveys, attention should be given to monitoring cracks, openings, joints, and other areas where contamination might accumulate.

3.6.2 Measure levels of total and removable surface contamination (see Procedures 2.3 and 3.6) at locations of elevated direct radiation identified by the scan and at additional representative surface locations.

3.6.3 Acceptable surface contamination levels will be established on a project-specific basis, with details, including decontamination instructions, provided in the Survey Work Plan.

3.7 Document results of contamination surveys in field records

PROCEDURE 2.3
DIRECT RADIATION MEASUREMENT

1.0 PURPOSE

1.1 To describe the method for measuring total alpha and beta radiation levels on equipment and building surfaces.

2.0 RESPONSIBILITIES

2.1 The Site Survey Manager is responsible for assuring that this procedure is implemented.

2.2 Survey team members are responsible for following this procedure.

3.0 PROCEDURE

3.1 Equipment

3.1.1 Ratemeter-scaler: Model 3, Model 2220 or 2221, Ludlum Instrument Corporation; or equivalent

3.1.2 Detector: Selected detectors are listed below: Equivalent detectors are also acceptable

Activity	Detector Type	Model
alpha	ZnS scintillator	Ludlum 43-1 or 43-5, Eberline AC3-7 or AC3-8
	gas proportional	Ludlum 43-68
beta	Geiger-Mueller	Ludlum 44-9, Eberline HP-260
	gas proportional	Ludlum 43-68

3.1.3 Cables

3.1.4 Check source

3.1.5 Record forms

3.2 Quality Control Check

3.2.1 Assemble instrument, turn on, check battery, and adjust high voltage and threshold, if necessary. Check background and check source responses. Follow the procedures described in Procedure 2.1.

3.3 Direct Measurement

3.3.1 When applicable, team members performing instrument checks will calculate the average and maximum "field action levels" for instrument combination based on the specific site criteria and background.

Action level (cpm) = [site criteria (dpm/100 cm^2) x E x G x T] + B

T = count time (minutes)
E = operating efficiency (counts/disintegration)
G = geometry (total detector area (cm^2)/100)

	Total Area	Active Area
43-5 detector area =	80 cm^2	60 cm^2
43-1 detector area =	80 cm^2	50 cm^2
43-68 detector area =	126 cm^2	100 cm^2
44-9 detector area =	20 cm^2	15.5 cm^2
HP-260 detector area =	20 cm^2	15.5 cm^2

B = background (cpm)

A field count at or above this value indicates that further investigation in this location is necessary.

NOTE: For a particular site, the action level may be established as any activity exceeding background.

3.3.2 Select an appropriate counting time. A counting time is desired which will achieve a minimum detectable activity (see Procedure 4.2) value less than 50% of the applicable criteria. For most radionuclides a 1-minute count, using the instruments listed above, is adequate to achieve this sensitivity. For radionuclides having guidelines of 5000 dpm/100 cm^2, average and 15,000 dpm/100 cm^2, maximum, 0.5 minute counting times may be acceptable.

3.3.3 Place the detector face in contact with the surface to be surveyed. The detector face is typically constructed of a very thin and fragile material, so care must be exercised to avoid damage by rough surfaces or sharp objects. (Scans should have been performed, prior to this point, to identify representative locations and locations of elevated direct surface radiation for measurement.)

3.3.4 Set the meter timer switch, press the count-reset button, and accumulate the count events until the meter display indicates that the count cycle is complete.

3.3.5 Record the count and time on the appropriate record form.

3.3.6 If the location has a surface activity level above background, the area around the measurement locations should be scanned to determine the homogeneity of the measured activity level in the area. Dimensions and activity levels of inhomogeneities should be documented on the appropriate record form.

3.3.7 The surface activity may be calculated according to Procedure 4.3.

PROCEDURE 3.6
REMOVABLE ACTIVITY SAMPLING

1.0 PURPOSE

1.1 To provide guidelines for measuring removable alpha and beta radioactivity on equipment and building surfaces.

2.0 RESPONSIBILITIES

2.1 The Site Survey Manager is responsible for assuring this procedure is implemented.

2.2 Survey team members are responsible for following this procedure.

3.0 PROCEDURE

3.1 Equipment and Materials

3.1.1 Smears, Mazlin wipes, filter papers (like Whatman 47 mm dia. glass fiber) or equivalent

3.1.2 Glassine or paper envelopes

3.1.3 Record forms

3.1.4 Counting equipment

3.2 Sample Collection

NOTE: Direct measurements will be completed before a smear sample is taken.

3.2.1 Grasp the smear (filter) paper by the edge, between the thumb and index finger.

3.2.2 Applying moderate pressure with two or three fingers, wipe the numbered side of the paper over approximately 100 cm^2 of the surface.

3.2.3 Place the filter in an envelope.

3.2.4. Record the smear number, site, date, location of the smear, and name of sample collector on the envelope.

3.2.5 Label and secure in accordance with Procedures 3.7 and 3.8. Record pertinent information on the Chain-of-Custody Form.

3.2.6 If the direct measurement was elevated, the smear should be monitored (procedures 2.2 and 2.3) to determine whether contaminated material was transferred to the smear. If an activity level greater than 250 cpm is detected, the smear envelope should be marked as such.

NOTE: Smears having activity levels greater than 2500 cpm should be counted using field instrumentation. Decisions regarding further analyses and method of disposal of contaminated smears will be made by the PM and SSM on a case-by-case basis.

3.3 Field Sample Measurement

3.3.1 If the object of the survey is to determine if radon or thoron daughter products or other short half-life radionuclides are present, the smears should be counted within 1-2 hours before significant decay of short-lived radionuclides has occurred.

3.3.2 If necessary, smears can be counted in the field using portable instrumentation (see Procedure 2.3).

3.3.3 Record count and counting time data on the appropriate record form.

3.3.4 Subtract the background count (determined by counting blank or unused smear) and convert net count to dpm/100 cm^2, using proper time and detector efficiency values.

$$\frac{DPM}{100\,CM^2} = \left(\frac{NETCOUNT}{TIME(\text{MIN}) * EFFICIENCY * \left(\frac{COUNT}{DISINTEGRATION} \right) * OTHERMODIFIYINGFACTORS} \right)$$